CARIBBEAN FOOD CROPS SOCIETY

49

Forty-ninth Annual Meeting 2013

Port of Spain, Trinidad and Tobago
Vol. XLIX

PROCEEDINGS

OF THE

49TH ANNUAL MEETING

Caribbean Food Crops Society
49TH Annual Meeting
June 30 – July 6, 2013

Hyatt Regency Hotel
Port of Spain, Trinidad and Tobago

"Agribusiness Essential for Food Security: Empowering Youth and Enhancing Quality Products"

Edited
by
Wanda I. Lugo, Héctor L. Santiago, Rohanie Maharaj, and Wilfredo Colón

Published by the Caribbean Food Crops Society

ISSN 95-07-0410

Copies of this publication may be obtained from:

Secretariat CFCS
P.O. Box 40108
San Juan, Puerto Rico, 00940

or from:

CFCS Treasurer
Agricultural Experiment Station
Jardín Botánico Sur
1193 Calle Guayacán
San Juan, Puerto Rico 00936-1118

Proceedings of the Caribbean Food Crops Society. 49:616-622. 2013

MANAGEMENT OF PEPPER WEEVIL, *ANTHONOMUS EUGENII* CANO (COLEOPTERA: CURCULIONIDAE) USING BIOLOGICAL AND CHEMICAL INSECTICIDES

D. R. Seal and C. M. Sabines. Tropical Research and Education Center (TREC), University of Florida-IFAS, Homestead, Florida, USA

ABSTRACT: Two studies were conducted to evaluate the effectiveness of various biological and chemical insecticides in managing pepper weevil (PW), *Anthonomus eugenii* Cano. The active components of biological insecticides were Chromobacterium subtsugae (Strain PRAA4-IT) (MBI 203) and Burkholderia sp. (strain. A396) (MBI 206). MBI-203 is also known as Grandevo™. Both MBI 203 and MBI 206 are active against insects upon ingestion. Biological insecticides provided significant reduction of PW when used in rotation with thiamethoxam (Actara®) and acetamiprid (Assail®). In another study, experimental insecticides (F9318) showed reduction of PW adults and infested fallen fruits. Thiamethoxam was effective against PW in both studies.

Keywords: Pepper weevil, bacterial insecticide, neonicotinoid, control.

Introduction

The pepper weevil (PW), *Anthonomus eugenii* Cano, is the most insidious biotic constraint on the production of various types of pepper (*Capsicum annuum* L.) in Florida, California, Texas, Mexico, Central America, and the Caribbean (Burke and Woodruff 1980, Patrock et al. 1992, Patrock and Schuster 1987). Feeding by larvae and adults (Figures 1 and 2) causes severe losses in both yield and fruit quality (Elmore et al. 1934, Schuster and Everett 1982). Campbell (1924) found up to 100% infestation of young pepper in commercial fields. Infested flowers and fruits are abscised and drop to the ground (Riley 1990, Seal and Schuster 1995). Moreover, high PW infestations have been observed to defoliate pepper plants and to prevent fruiting (Rolston, 1977).

Currently pepper growers use oxamyl (Vydate®) and Thiamethoxam (Actara®) to combat PW. Frequent use of these insecticides may cause development of resistance in PW. In the present study, we assessed potentiality of biological insecticides and new chemical insecticides in managing PW in pepper fields.

Materials and Methods

Two studies were conducted in Tropical Research and Education Center, University of Florida, research plots at Homestead, Florida. Transplants of `Jalapeno' pepper were set 12 March 2012,12 inches apart on 8 inches high and 32 inches wide beds of Rockdale soil. The beds were supplied with drip irrigation lines and covered with 1.5-mil thick black polyethylene mulch. Plants were irrigated twice daily using the drip system. Fertilizer (N-P-K mix) was applied at 200-50-240 lb/acre at the time of preparing beds.

In the first study, various treatments evaluated were: 1. MBI-203 DF2 at 2 lbs/acre; 2. MBI-203 DF2 at 3 lb/acre; 3. MBI-206 EP at 1 gallon/acre; 4. MBI-206 EP at 2 gallon/acre; 5. MBI-203 DF2 at 1 lb/acre + MBI-206 EP at 1 gallon/acre; 6. MBI-206 EP at 2 gallon/acre rotated with MBI-203 DF2 at 2 lbs/acre;7. MBI-203 DF2 at 2 lbs/acre rotated with Assail 30SC (acetamiprid) at 4 oz/acre; 8. MBI-206 EP at 2 gallon/acre rotated with Assail 30SC (acetamiprid) at 4 oz/acre; 9. MBI-206 EP at 2 gallon/acre followed by Actara (thiamethoxam) at 5 oz followed by MBI-206 EP at 2 gallon/acre followed by Assail 30SC (acetamiprid) at 4 oz/acre. Thiamethoxam (Actara) was used as a commercial standard. All insecticide treatments were compared with a nontreated check treatment where all plants were sprayed with water. All treatment plots were each 30 ft long and 3ft wide replicated four times in randomized complete block design.

In the second study, treatments evaluated were: 1. F9318 at 15 and 19 oz/acre; 2. thiamethoxam (Actara) at 3.75 oz/acre; and 3. a nontreated check. All treatment plots were each 30 ft long and 3ft wide which were replicated four times in randomized complete block design.

Application of all treatments was initiated one week before flowering. Treatments in both studies were applied once a week for four weeks using a backpack sprayer delivering 70 gallons per acre at 30 psi. Evaluation of insecticides was made 48 h after each application by thoroughly checking five plants per treatment plot for PW adults. PW infested fruits and flowers were also collected at the time of checking plants at flowering and fruiting. Infestation was confirmed by dissecting flowers and fruits to observe pepper weevil development stages.

Statistical Analysis

Data were analyzed using SAS Version 7 (SAS Institute Inc., 1998). All data were transformed (square root of x + 0.25) to stabilize error variance. General linear model procedures were used to perform analysis of variance. Means were separated by using Duncan's Multiple Range Test (DMRT).

Results and Discussion

In the first study, bacterial insecticides significantly reduced PW adults on all sampling dates when compared with the nontreated control (Figure 3). MBI 203 did not differ among experimental rates in reducing PW adults. On the other hand, MBI 206 provided better reduction of PW adults than MBI 203. MBI 203 at 2 lbs/acre rotated with acetamiprid significantly reduced PW adults when compared with nontreated control and other insecticide treatments. Similar result was observed when MBI 206 was rotated with acetamiprid. Thiamethoxam alone or in rotation with MBI products and acetamiprid provided superior reduction of PW adults when compared with the nontreated control.

All bacterial insecticides (MBI-203 and MBI 206) significantly reduced PW infested fallen fruits (Figure 4). Thiamethoxam alone or in rotation with MBI products and acetamiprid provided superior reduction of PW infested fruits.

In the second study, F9318 (15 and 19 oz/acre) and thiamethoxam significantly reduced PW adults when compared with the nontreated control (Figure 5). Infested fruits were also significantly fewer on the F9138 treated plants than on the nontreated plant (Figure 6).

Conclusion

FBI 9318 products are effective in suppression of pepper weevil populations on pepper. Use of FBI 9318 products can be used in rotation with other chemical insecticides to manage pepper weevil populations in pepper. This practice will help reducing use of chemical insecticides and delay development of resistance in pepper weevil against any specific insecticide.

Acknowledgement

We acknowledge Charlie Carter, Jacinto Betancourt and Jesus Teyes for helping us with data collection. We also thank Jose Castillo for helping us with land preparation and other useful cultural practices to grow pepper.

Literature cited

Burke, H.R. and R.E. Woodruff. 1980. The pepper weevil, Anthonomus eugenii Cano in Florida (Coleoptera: Curculionidae). Fla. Dept. Agr. Consumer Serv. Entomol. Cir. 219, 4 pp.

Patrock, R. J. and D.J. Schuster. 1987. Field survey for the pepper weevil, Anthonomus eugenii, on nightshade. Proc. Fla. State Hort. Soc. 100:217-220.

Elmore, J.C., A.C. Davis and R.E. Campbell. 1934. The pepper weevil. U.S. Dept. Agr. Tech. Bull. 447, 27pp.

Schuster, D.J. and P.H. Everett. 1982. Control of the beet armyworm and pepper weevil on pepper. Proc. Fla. State Hort. Soc. 95: 349-351.

Riley, D.J. 1990. Refined sampling methodology and action thresholds for the pepper weevil, Anthonomus eugenii Cano (Coleoptera: Curculionidae). Ph. D. Dissertation, University of Florida, Gainesville, FL. ,

Seal, D.R. and D.J. Schuster. 1995. Control of pepper weevil, Anthonomus eugenii in west-central and south Florida. Proc. Fla. State Hort. Soc. 108: 220-225.

Rolston, L.H. 1977. Insecticide tests in laboratory and field against the pepper weevil, Anthonomus eugenii Cano. J. Ga. Entomol. Soc. 12: 117-120.

Figure 1. Pepper weevil adult

Figure 2. Pepper weevil larvae inside a pepper fruit

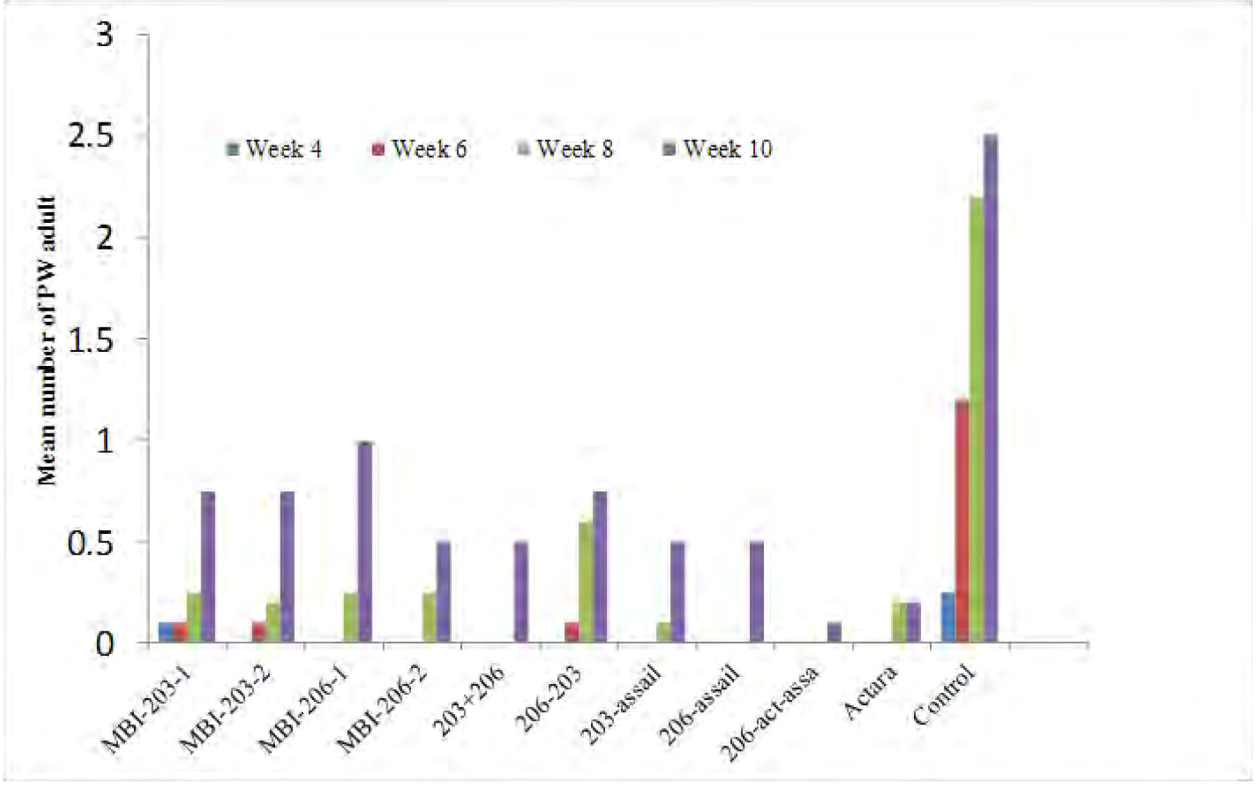

Figure 3. Mean numbers of pepper weevil adults/ 25 feet long plot (four replications) on various sampling dates.

Illustration of X axis labels. MBI-203-1: MBI-203 at 2 lb/acre, MBI-203-2: MBI-203 at 3 lb/acre, MBI-206-1: MBI-206 at 1 gallon/acre, MBI-206-2: MBI-206 at 2 gallon/acre, 203 + 206: combination of MBI 203 at 1 lb/acre and MBI 206 at 1 gallon/acre; 206-203: MBI-206 EP at 2 gallon/acre rotated with MBI-203 DF2 at 2 lb/acre; 203-assail: MBI-203 DF2 at 2 lb/acre rotated with acetamiprid at 4 oz/acre; 203-assail: MBI-206 EP at 2 gallon/acre rotated with acetamiprid at 4 oz/acre; 206-act-assa: MBI-206 EP at 2 gallon/acre followed by thiamethoxam (Actara) at 5 oz/acre followed by MBI-206 EP at 2 gallon/acre followed by acetamiprid (Assail 30SC) at 4 oz/acre.

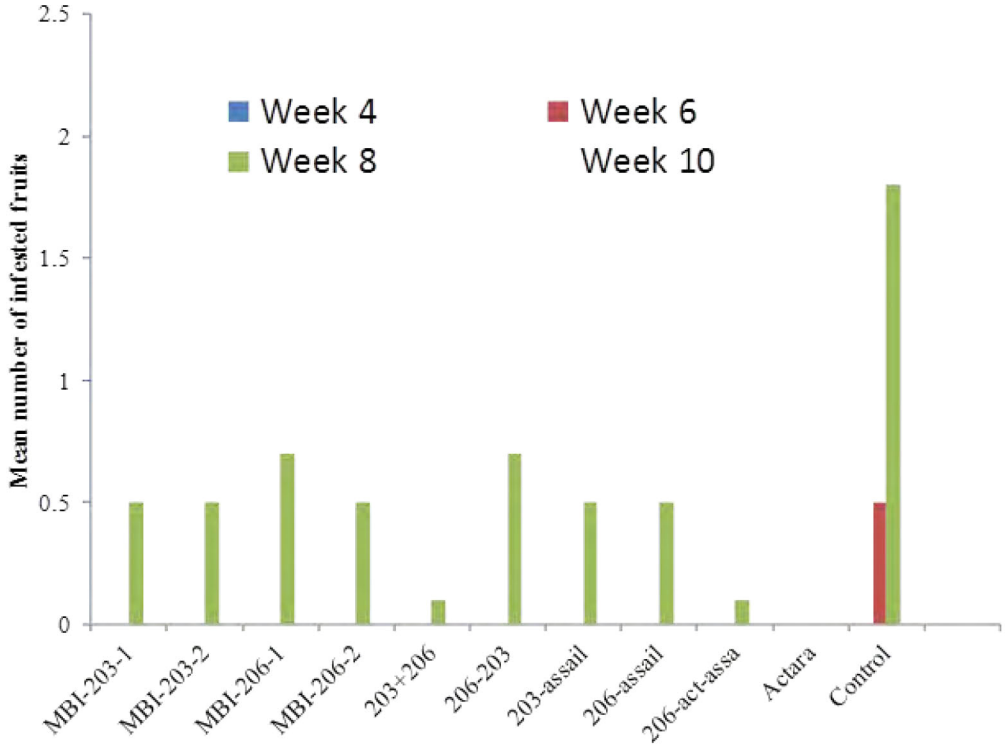

Figure 4. Mean numbers of infested fruits/25 feet long plot (four replications) on various sampling dates.

Illustration of X axis labels. MBI-203-1: MBI-203 at 2 lb/acre, MBI-203-2: MBI-203 at 3 lb/acre, MBI-206-1: MBI-206 at 1 gallon/acre, MBI-206-2: MBI-206 at 2 gallon/acre, 203 + 206: combination of MBI 203 at 1 lb/acre and MBI 206 at 1 gallon/acre; 206-203: MBI-206 EP at 2 gallons/acre rotated with MBI-203 DF2 at 2 lbs./acre; 203-assail: MBI-203 DF2 at 2 lbs./acre rotated with acetamiprid at 4 oz/acre; 203-assail: MBI-206 EP at 2 gallons/acre rotated with acetamiprid at 4 oz/acre; 206-act-assa: MBI-206 EP at 2 gallons/acre followed by thiamethoxam (Actara) at 5 oz/acre followed by MBI-206 EP at 2 gallons/acre followed by acetamiprid (Assail 30SC) at 4 oz/acre.

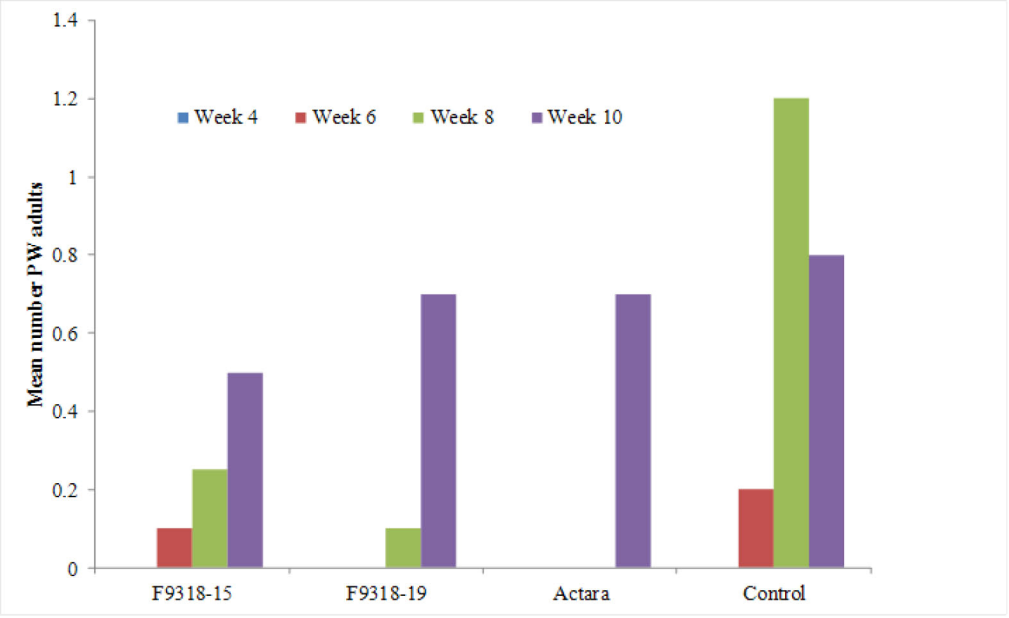

Figure 5. Mean numbers of pepper weevil adults/25 feet long plot (four replications) on various sampling dates.

Illustration of X axis labels. F9318-15: F9318 at 15 oz/acre; F9318-19: F9318 at 19 oz/acre; Actara (thiamethoxam): Actara at 3.75 oz/acre

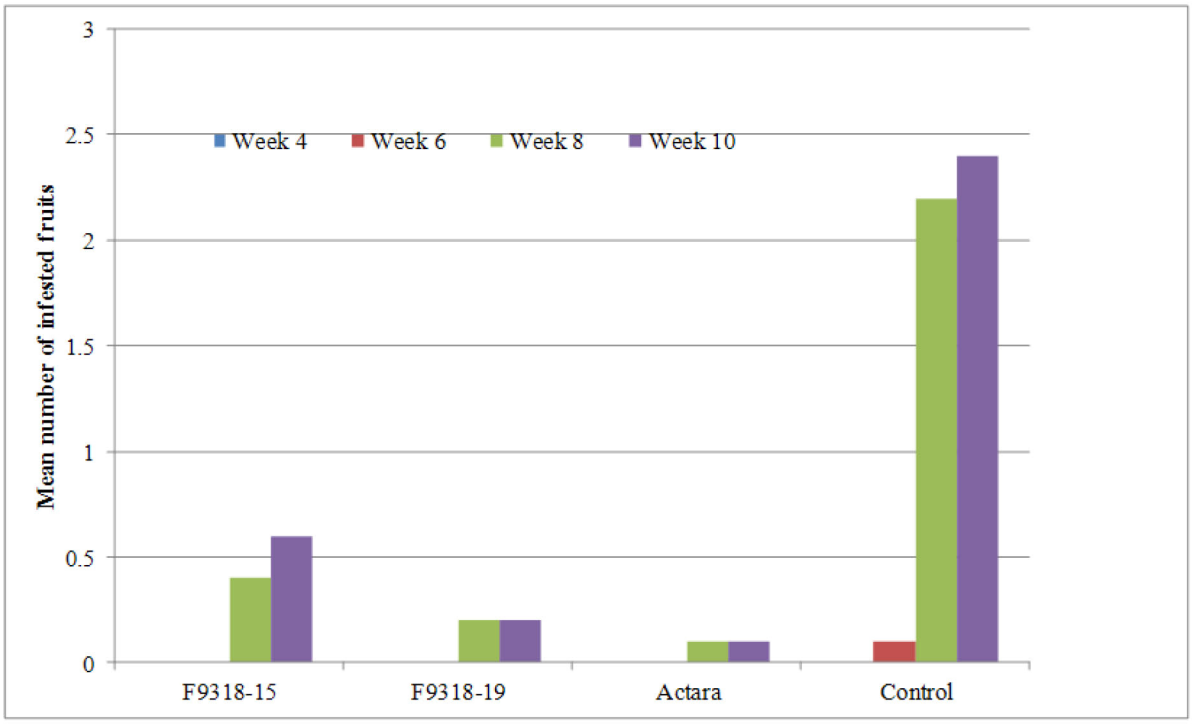

Figure 6. Mean numbers of infested fruits/25 feet long plot (four replications) on various sampling dates.

Illustration of X axis labels. F9318-15: F9318 at 15 oz/acre; F9318-19: F9318 at 19 oz/acre; Actara (thiamethoxam): Actara at 3.75 oz/acre