INSECTS ASSOCIATED WITH TOMATOES AND CUCUMBERS IN THE UPPER AGUAN VALLEY OF HONDURAS[1] /

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Resumen

Se presenta una lista comentada de los insectos asociados con tomate y pepino cohombro que se encuentran en el Valle de Aguán, Honduras. Se incluye los insectos dañinos así como las especies beneficiosas observadas en el área. Las especies más comunes se evalúan con respecto al grado de daño ocasionado y a su abundancia; también se incluye las partes de las plantas atacadas por especies fitófagas, así como las especies atacadas por insectos beneficiosos.

Introduction

The Aguan Valley is a relatively isolated valley which follows along the north coast of Honduras behind the coastal range of mountains The upper Aguan Valley is inland about 50 kilometers south of La Ceiba. The upper regions of the valley receive an average of 875 mm of rain per year which comes mostly during the months of July through November. The rest of the year is mostly dry. The vegetation is semiarid in nature consisting mostly of scrub brush and succulents. With the exception of irrigated banana farms very little agriculture is practiced, except for scattered small corn fields during the rainy season. Most of the area is grazed by cattle.

During 1975 to 1979 Standard Fruit Company conducted research and semi-commercial operations aimed at evaluating the potential of the region for commercial production of tomatoes and cucumbers during the months of October through April.

A study of the insect populations associated with the tomato and cucumber plantings was undertaken to determine the species that would affect the crops in the region and to determine the role and importance of each insect species. Nineteen species of phytophagous insects were observed associated with tomatoes and 23 species were observed from cucumbers. Six species were considered important regarding each tomato and cucumber production. Three species (*Heliothis zea, Pseudoplusia includens* and *Diabrotica balteata*) were considered potentialy serious threats to both crops. The plant part damaged by each species was recorded as well as the pest status and relative abundance. Beneficial insects were also observed during the study and their relative abundance was noted.

Methods

The vegetable production areas studied in the upper Aguan Valley were cleared from wild lands

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which were completely removed from agricultural crops and other vegetable production regions of the country.

The list of insects associated with tomato and cucumber plantings was obtained through collections of adult and immature specimens on routine visits to the farms. Insects were collected mostly by hand picking from plants but collections were also made by beating the foliage and from pit traps set in the rows under the plant foliage.

Collections were made both during daylight hours and after dark with the aid of a flash light from both insecticide untreated research plots and from the commercial production areas of the farm.

Observations of insect behavior, damage, and the plant parts attacked were made by the author in the field during both daylight and night hours.

Immature specimens were brought to the laboratory and reared to adults so they could be identified and adults and larvae associated. Field collected immature specimens were placed on caged plants in the laboratory and observed until they completed development to adults.

Insect populations and damage levels were monitored daily throughout the crop season from both research plots and the commercial production areas. Each day the survey data was sent to the entomology group where insect populations and damage levels were evaluated.

Table 1. List of phytophagous insects on tomato plantings:

Insects	Plant part[1] Attacked	Pest[1] Status		Relative[2] Abundance
LEPIDOPTERA				
Heliothis zea (Boddie)*	Stems, fruit	P	1	1
Spodoptera eridania (Cram.)*	Leaves, shoots, young plants	P	2	1
*Spodoptera dolichos (F.)**	Leaves, shoots, fruit	P	2	2
Pseudoplusia includens (Wlk)*	Leaves	P	2	1
HEMIPTERA				
Sagotylus confluentus (Sag.)	Foliage	O	3	2
Leptoglossus zonatus (Dallas)	Foliage	P	2	2
Largus sp	Foliage	P	2	1
Staluptus marginalis (Burm.)		N	–	3
Phthia picta (Drury)	Foliage	P	2	1
Lygaeus reclivatus Say		N	–	2
Jadera haematoloma (H.–S.)		N	–	3
Chelinidea tabulata (Burm.)	Foliage	P	3	2
ORTHOPTERA				
Xyleus discoideus (Servilla)	Foliage	O	3	3
Schistocerca nitens nitens (Thunberg)	Foliage	P	2	2
Schistocerca americana americana (Drury)	Foliage	P	2	2
COLEOPTERA				
Diabrotica balteata Lec.*	Foliage, young plant	P	2	1
Diabrotica viridula Fabr.	Fruit	O	3	3
DIPTERA				
Leafimner*	Leaves			
HOMOPTERA				
Aphididae	Stems, leaves	O	2	2

1) Pest status

P – pest status
O – occasional pest
N – not a pest

1. serious pest
2. damage is secondary
3. may cause minor damage occasionally

2) Relative abundance

1 – usually abundant
2 – uncommon
3 – rare

Results

Tables 1, 2 and 3, list those insects which are phytophagous to tomato plantings and cyrcumbers, and the insects which are beneficial to both crops, respectively.

Annotated list of the more economically important insects on tomatoes

Heliothis zea (Boddie)

Common name: Tomato fruitworm

H. zea caterpillars were the most serious pest of tomatoes. Larvae were first observed boring into the main stem of plants about 2 to 3 weeks after planting. As the plants began to set fruit the caterpillars would begin boring into and damage the green fruits.

H. zea larvae were always present but generally were more difficult to control as the season progressed and various tomato plantings of progressive ages provided a continuing source of host plant material. Early in the growing season and during the first fruit formation stages of specific cycles 0.05 *Heliothis* larvae per plant was considered the economic threshold. Toward the end of production cycle *Heliothis* were allowed to reach a maximum of 0.10 larvae per plant before treatment, which would translate into 1.5 to 2% damaged fruit.

Table 2. List of phytophagous insects on cucumbers.

Insects	Plant Part[1] Attacked	Pest[1] Status		Relative[2] Abundance
LEPIDOPTERA				
Heliothis zea (Boddie)*	Flowers, scar fruit	P	1	2
Diaphania nitidalis (Stoll)*	Fruit, terminal shoots	P	1	1
Diaphania hyalinata (Linnaeus)*	Leaves, terminal bud	P	1	2
Spodoptera exigua (Hub.)	Leaves	O	2	2
Spodoptera sunia (Gn.)	Leaves	O	2	2
Pseudoplusia includens (Wlk)	Leaves, scar fruit	P	1	1
HEMIPTERA				
Largus sp	Vegetative parts	O	2	2
Oncopeltus sexmaculatus Stal.	–	N	–	3
Sagotylus confluentus (Say)	–	N	–	3
Leptoglossus zonatus (Dallas)	Stems, shoots	O	2	2
Leptoglossus gonagra (Fabr.)	Stems, shoots	O	2	2
Phthia lunata (Fabr.)	Stems, shoots	O	3	3
Anasa nr. *scorbutica* (F)*	Stems, shoots	O	1	1
Catorhintha sp.	–	N	–	3
Polymerus testaceipes (Stal.)	Leaves	O	2	2
HOMOPTERA				
Aphididae	Leaves, shoots	O	1	2
COLEOPTERA				
Diabrotica balteata Lec.*	Young plants, leaves, flowers	P	1	1
Diabrotica porracea (Harold)	Leaves, flowers	N	3	3
Epilachna tredecimnotata (Latreille)	Leaves	N	3	3
Epilachna discincta Wise	Leaves	N	3	3
Metrioides karli Wilcox	Flowers	N	–	1
Acalymma sp.	Leaves	O	2	2
Acmaeodera flavomarginata Gray	Flowers	N	–	3

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Table 3. List of beneficial insects on tomatoes and cucumbers.

	Relative Abundance	
	Cucumbers	Tomatoes
HEMIPTERA		
Zelus sp.	2	2
Sinea sp.	1	2
Geocoris punctipes (Say)	1	2
Orius tristicolor (White)	1	2
Cardiastethus sp.	2	3
NEUROPTERA		
Chrysopidae	3	–
COLEOPTERA		
Cycloneda sanguinea Linn.	2	2
Megacephala ignea Bates	3	3
Cicindela ocellata Klug.	1	1
Galerita mexicana Chaud.	2	2
Cheanius aurolimbatus Laf.	1	1
Athostrictus sericatus Bates	2	2
Calleida decora (Fab.)	1	1
Pasimachus cordicollis Chaud.	2	2
	Host Attacked	
DIPTERA		
Archytas sp.	*Spodoptera* sp.	
Allograpta exotica (Wied.)	Aphidae	
Eucelatoria sp.	*Heliothis zea*	
Drino nr. *rhoeo*	*Spodoptera* sp.	
HYMENOPTERA		
Chelonus insularis (Cr.)	*Spodoptera* sp.	
Sphex dorsalis Lap.	–	
Trypoxylon sp.	Spiders	
Ectemnius sp.	–	

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Spodoptera eridania (Cram.) and *S. dolichos* (F.)

Both species of *Spodoptera* were common on tomato plantings, feeding on the leaves and shoots of the plants. *S. eridania* usually attacked younger plants. Adults would often lay eggs on newly emerged plants in the cotyledon stage. *S. eridania* larvae were not observed to damage fruit. However, larvae of *S. dolichos* tended to be found on older plants and on occasion were observed feeding on tomato fruit. *S. eridania* was the more common of the two species.

Pseudoplusia includens (Wlk.)

Common name: Soybean looper

A common caterpillar on tomato plantings in the Coyoles region, the soybean looper was always present but rarely proved to be a serious economic problem in tomatoes. Feeding of the caterpillars was limited to the leaves. They were never observed to damage fruit.

Schistocerca sp.

Two species of grasshoppers of the genus *Schistocerca* fed on tomato plants. The most common and most important pest species was *S. americana americana*. *S. nitens nitens* was also present , but was of secondary importance. Neither species was ever present in significant numbers so as to require control

Diabrotica balteata Lec.

Adults fed on the leaves and new shoots of tomato plants of all ages. Significant damage occurred on smaller plants. Mortality of young and emerging plants occurred in some situations. Frequently control measures had to be taken within the first 3 weeks Newly transplanted seedlings sometimes had to be treated to protect the main stem and new shoots until they were established.

Annotated list of the more economically important insects on cucumbers

Heliothis zea (Boddie)

Early instar larvae of *Heliothis zea* were commonly observed associated with the cucumber flowers, but damage was not observed The young larvae may have been feeding on the pollen. Late instar larvae were observed to feed on the surface of fruit producing a brown colored scar on the fruit. Feeding by *H. zea* was only superficial. Larvae were not observed to enter the fruit, which is an interesting behavior pattern because normally this species bores into the plant part attacked. Populations of *H. zea* on tomato plantings nearby exhibited the behavior of boring into the fruit and plant stems. Usually scarring damage due to *H. zea* was not of economic importance.

Diaphania nitidalis (Stoll)

Common name: Pickleworm

This was a serious pest each time that cucumbers were planted. The larvae of this pest started attacking and boring inside the terminal shoots about 3 weeks after planting. The yound fruit started forming 4 and 5 weeks after planting. At this time the caterpillars moved to the young fruit destroying much of it. Excellent control of this pest was obtained by an insecticide *application* at 42 days. Usually this controlled *Diaphania nitidalis* for the rest of the season.

Diaphania hyalinata (Linnaeus)

Common name: Melonworm

While this insect was consistently a potential danger, it seldom became a serious pest. *Diaphania hyalinata* was most serious from about 2 to 5 weeks after planting when the larvae would infest the rolled leaves in the buds as they were opening.

Pseudoplusia includens (Wlk)

This is perhaps the most common lepidopterous caterpillar in the cucumber fields. The larvae of *Pseudoplusia includens* fed on both leaves and fruit, and were responsible for most of the fruit scarring in cucumbers. Scarring usually took place near the stem end of the fruit. Often the scarring was minor and did not result in the fruit being rejected on the packing line.

Fruit scars caused by *Pseudoplusia* includens could usually be separated from those of *Heliothis zea* and *Spodoptera* sp. caterpillars by location and texture of the scar on the fruit. Scars due to larvae of *H. zea* and various *Spodoptera* were on the sides of the fruit, and were usually more superficial and wider and of a different texture.

Caterpillars of *P. includens* first appear about 1 to 3 weeks after planting. Populations of caterpillars generally begin very low in the range of .005 per plant and within 1 to 2 weeks reach population densities of 0.1 to 0.2 larvae per plant. Generally by the 4th week after planting populations are about 0.2 larvae per plant. Populations of *P. includens* caterpillars in this range and below 0.4 caterpillars per plant are below economic thresholds.

Before fruit formation there was no significant damage to the plants. After fruit set some scarring would occur, but fruit rejection levels would be below the .5% level

Anasa nr. *scorbutica*

Feeding by these bugs on the growing tips caused deformation of the vines and in some cases death of the growing tips. During the normal commercial growing season from October to March, *Anasa* was not an important pest, but when cucumbers were grown during the wet months serious damage occurred.

Leptoglossus sp.

Two species of the genus *Leptoglossus* are commonly present on cucumbers in about equal numbers

In some plantings one or the other would be more abundant, but both were normally present. Adults were observed feeding on stems and shoots of the cucumber plants

Diabrotica balteata Lec.

This is a very common beetle throughout the Aguan Valley. Young plants were attacked shortly after emerging. The adult beetles feed heavily on the underside of the cotyledons and on the stems. Stem feeding often killed the newly emerged plants. After 1 or 2 true leaves were developed damage levels were lower. Populations of *D. balteata* were low as the plants emerged from the soil, and built up rapidly during the next 1 to 2 weeks. Populations remained at high levels for the first 5 to 6 weeks and then declined. Peak adult populations in cucumber plantings reached 1.5 beetles per plant.

Several insecticide sprays tested had little or no effect on the population density in the plantings: any effect noted was only short lived, usually less than 24 hours. The cucumber production area was so small compared to the total beetle population in the region and the insect population was so mobile that the numbers killed by the spray were insignificant to the total environmental density, so were rapidly replaced from outside with little effect on the regional population.

Metrioides Karli wilcox

This is a very abundant chrysomelid beetle commonly found in the flowers, particularly during the morning hours. The beetles did not appear to harm the flowers or vegetative parts of the plants, so they were not considered a pest. The adult beetles are very mobile about the field. They may have some importance in pollination.

Geocoris punctipes (Say)

G. punctipes was the most common predator regularly observed on cucumber plantings. Adults were observed to be active throughout the cucumber growing season. Adult densities ranged between 0.1 and 0.2 per plant based on daily insect surveys. In cucumber cycles where insect pest problems developed and insecticides had to be used, populations were significantly reduced or eliminated. Peak densities were reached about 3 weeks following planting and remained more or less stable through the growing season.

Orius tristicolor (White)

This anthocorid predator was one of the most common predators in cucumber fields. Adults and nymphs were frequently observed in the flowers and on the foliage, particularly near the terminal buds. Populations of this insect varied between plantings, ranging from near zero to 1.8 per plant. Population densities for *O. tristicolor* are low due to its small size and secretive habits such as hiding inside the opening leaves of the terminal bud. Population counts actually represent mostly the numbers in the flowers.

Cucumber insects from other regions of Honduras

Two regions besides the upper Aguan Valley were investigated for potential cucumber growing regions. One was in the Comayagua Valley and the other in the Department of Copan near the town of Florida. Surveys of the insects attacking experimental plantings of cucumbers in these regions showed many similarities in the insect fauna, but also showed some differences.

Two groups of insect pests which did not show up on cucumbers in the Aguan Valley were commonly observed in both of the above regions. One: whiteflies were present on all plantings observed and became abundant on some plantings. Two: mirid bugs were present on plants in both regions on a regular basis.

Two species of mirids have been identified as pests on cucumbers: *Halticus bractatus* (Say) and *Cyrtopeltis notatus* (Distant). *H. bractatus* is the most common on cucumbers. Damage occurs to the young plants when heavy feeding takes place on the leaves, particularly on the young plants in the first 3 to 4 weeks after emergence.

Discussion

Because of the isolation of the region, lack of any other farming (except bananas), and the relatively small size of vegetable operations compared to the total area, the insects associated with the vegetable plantings adapted from a variety of native hosts in the area. The study of the insect populations is of particular interest because it represents a transfer of insects from native plants to a commercial tomato or cucumber cultivar. Evaluation of the insect populations on the vegetable plantings provide insight into which native species in the area will affect tomato and cucumber plants, the relative importance and abundance of the various species, and may help point out native Central American species that could be a potential pest in other parts of the world if introduced.

Lepidoptera larvae were the most damaging of the phytophagous species collected on both crops. Of the eight species collected from both crops only 2 were common to both tomatoes and cucumbers. Even though *Spodoptera* larvae attack both crops the species were different.

Eleven Hemiptera were observed from the 2 crops. Only 3 were common to both tomatoes and cucumbers. The most diverse fauna was observed on cucumbers: a total of 9 species. Only 2 species were restricted to tomatoes

The diversity and potential impact of coleoptera was much greater on cucumber plantings. No species were unique to tomatoes, yet they were a serious pest to cucumbers. Damage due to Orthoptera appeared to be restricted to tomatoes. Of the 3 species observed in the vegetable plantings, none were recorded from cucumbers.

Cucumbers attracted the most diverse insect fauna from the region. Fifteen species were specific to cucumbers of a total of 23 species collected. Eleven species were specific to tomatoes from a total of 19 species collected.

Abstract

An annotated list of insects associated with tomato and cucumber plantings in the Aguan Valley of Honduras is presented. Insect pests as well as beneficial species are listed relative to pest status abundance, and plant parts attacked for phytophagous species and hosts attacked for beneficial species. The more common species are discussed with regard to their association with the tomato and cucumber plantings.

Reseña de libros

BUTTLER, B. E. Soil classification for soil survey. Oxford University Press, Great Britain. 1980. 129 p.

En la literatura actual, es difícil encontrar textos que al estudiarlos de cubierta a cubierta, el lector sienta que adquirió algo valioso, como en este caso. Butler, con una experiencia en el campo de la clasificación de suelos de más de 30 años, nos sorprende con esta obra en la cual cubre aspectos sobre la filosofía de los sistemas de clasificación.

El libro consta de tres grandes tópicos: el concepto de ordenamiento de la población de los suelos, el establecimiento de un sistema de clasificación de suelos con fines cartográficos y el resumen y comentario de algunos sistemas de clasificación de suelos en vigencia

En el prefacio, aparecen dos frases que resumen los objetivos del libro; la primera de ellas "MUCHO SE DICE, POCO SE PRUEBA" y la segunda "NADIE LE ENSEÑA AL ESTUDIANTE COMO JUZGAR (la bonanza de un sistema)". El autor emplea la primera parte del libro discutiendo la base del procedimiento estadístico a emplear en el diseño y la comprobación de las clases en un sistema de clasificación. De aquí que la primera frase cobre relevancia al concluirse con la idea de sistemas jerárquicos en los que los niveles superiores se definen en términos de RACIONALIZACION (no comprobación).

La segunda parte del libro, se basa en la idea de un sistema de clasificación con un propósito doble: predecir y generalizar. Butler considera que estas dos funciones deben ser analizadas en términos estadísticos y presenta un método para probar la bonanza de las clases. Ahora se cumple con el segundo objetivo, existe un mecanismo para juzgar.

Para terminar, se discuten los fundamentos principales de doce sistemas de clasificación de suelos. Se presentan en forma resumida los principales aspectos de cada uno, discutiéndose en términos evolutivos el desarrollo de los mismos tanto en forma positiva como negativa.

El texto merece estar incluido en la biblioteca de todas aquellas personas que trabajen en clasificación de suelos. Como referencia debería emplearse en los cursos sobre este teme al tratar el capítulo sobre principios de clasificación.

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Notas y comentarios

Premio Nobel 1983 de Fisiología y Medicina

Hace cuarenta años, Bárbara McClintock propuso la presente teoría de los genes reguladores, pero es sólo en la última década que su trabajo ha sido reconocido por el mundo académico. En los novecientos cuarenta, cuando presentó evidencia que sugería la existencia de elementos controladores, además de los genes estructurales (los pedazos de DNA codificados para proteínas), no se le prestó atención y hasta fue ridiculizada. Pero no fue por esta contribución, que hace ahora elemental la existencia de genes estructurales y reguladores, sino por su posterior descrubrimiento de que algunos elementos controladores podían cambiar su posición en los cromosomas (los llamados "genes saltadores"), que Bárbara McClintock ha ganado el premio Nobel de Fisiología y Medicina de 1983.

Desde los novecientos veinte en que empezó a trabajar en Cornell, pasando en los novecientos cuarenta a trabajar y vivir en el Laboratorio de Cold Spring Harbor, en el Estado de Nueva York, McClintock ha trabajado siempre con el maíz. Los "genes saltadores" son hoy una parte familiar, aunque todavía no muy comprendida, de la biología molecular. Son segmentos de DNA que tienen la capacidad de moverse a través del genoma e insertarse en otras partes. Mucho antes de que se supiese de la doble hélice y de las claves genéticas, McClintock obtuvo resultados que podrían ser explicados mejor al suponer que habían genes que controlaban a otros genes, y que algunos de estos se podían mover por el genoma y controlar toda clase de genes diferentes. El concepto de regulación del gen era enteramente nuevo para los genetistas y cuando McClintock lo presentó, fue virtualmente desdeñado. Esto la hizo retirarse un poco en su laboratorio, aunque sus investigaciones continuaron. Desde esa época de desengaños, publicó la mayor parte de sus resultados en el informe anual del laboratorio. Esto motivó que, varias décadas después, esos volúmenes fueran buscados en las bibliotecas académicas, conforme sus investigaciones fueron poco a poco reconocidas por su trascendencia.

No fue hasta que los genes saltadores fueron claramente demostrados en bacterias por James Shapiro, que la gente del mundo científico comenzó a aceptar las ideas de Bárbara McClintock. Estos elementos eran los responsables de que la resistencia de las bacterias a los antibióticos se propagase rápidamente entre la población bacteriana como si fuera un contagio de proporciones epidémicas. Es que en el fenómeno de la conjugación, las bacterias se juntan por momentos e intercambian material genético, es decir, los genes saltadores de McClintock.

Otras investigaciones de esta mujer se reconocen también ahora como contribuciones notables. Una de ellas fue, como mencionamos al principio, su propuesta, al explicar los resultados en la herencia de la pigmentación de los granos de maíz, de que existían dos genes además del gen mismo del pigmento (gen estructural). Uno estaba bastante cerca del gen del pigmento, y parecía un verdadero interruptor, que encendía y apagaba el gen estructural. El segundo estaba localizado a alguna distancia en el cromosoma y parecía regular la actividad de apagado y encendido del primero. A estos los llamó "elementos controladores" precediendo así, por más de una década, el trabajo de Jacob y Monod sobre genea promotor y supresor.

Una segunda investigación fue la que, con su colega Harriet Creighton, establecieron inequívocamente que durante el "crossing over" los cromosomas intercambiaban material físico e información genética. Según Shapiro, este trabajo, por sí mismo, debería haber recibido un premio Nobel.

Cuando se le comunicó la noticia del premio Nobel, Bárbara McClintock emitió unas declaraciones que describían "este extraordinario honor". "Puede parecer injusto, sin embargo, premiar a una persona por haber tenido tanto placer en el transcurso de los años, pidiendo a la planta de maíz resolver problemas específicos y observando entonces su respuesta". Aunque ya ha pasado los ochenta años de edad, Bárbara McClintock sigue observando. Adalberto Gorbitz.