NATURAL ENEMIES OF BOLLWORM COMPLEX AND OTHER FOLIAGE FEEDING WORMS IN NORTHERN TAMAULIPAS AND THEIR ROLE IN COTTON PRODUCTION

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Abstract

Cotton, *Gossypium hirsutum* has been grown in the Mexico state of Tamaulipas for the last six years. Production areas have varied but the trend is to increase, particularly since NAFTA has made other crops less attractive. Insect pest control is a key variable. The boll weevil, *Anthonomus grandis grandis* Boheman, cotton fleahopper, *Pseudatomoscellis seriatus* (Reuter) and the bollworm *Helicoverpa zea* (Boddie) and tobacco budworm (TBW), *Heliothis virescens* (Fabricius) are among the insects that generally require chemical control.

Bollworm and TBW larvae were collected during the cotton season and kept in diet under controlled conditions to determine the fluctuation of species and parasitoids. Field data collected to check the presence of these two species showed that during the first weeks of fruiting, TBW comprised more than 50% of the field-collected larvae.

Information collected since 1990 in Tamaulipas shows that natural enemies of the bollworm and TBW play an important role in suppressing them. Based on predator data, hemipterans were more abundant than any other species during the 1995 cotton season. Hot days and low rainfalll exacerbated the insect pest problem, with the ocurrence of damaging populations of the silver leaf white fly and aphids.

Introduction

Tamaulipas is located in the northeastern part of Mexico separated from the Texas Rio Grande Valley region by the Rio Grande River. It has the largest solid crop area (irrigated and dryland) in the country and Latin America. The state has more than 4 million acres of agricultural land with 2.7 million acres of dryland and 1.3 million acres of irrigated land. Cotton (*Gossypium hirsutum*) is a crop that in the 1940's and 1950's was the most important crop for the economy of Tamaulipas (Zorrilla 1967).

Cotton more recently has been grown in Tamaulipas Mexico for the last six years; the trend shows an incremental increase in acreage in the entire state for the incoming years (Table 1). In Northern Tamaulipas cotton is planted from the Bravo River (Rio Grande River) down to the Conchos River in San Fernando, Tamaulipas, an area approximately 100 miles from the internation-al border.

During these years, the main insect pest problems have been: the cotton fleahopper *Pseudatomoscelis seriatus* (Reuter); boll weevil *Anthonomus grandis grandis* Boheman; and the bollworm complex described in two species *Heliothis virescens* (Fabricius) and *Helicoverpa zea* (Boddie). The tobacco budworm has been reported by Vargas-Camplis and Wolfenbarger (1992, and 1993) proportionally higher during the first fruiting weeks of the cotton season in northern Tamaulipas.

In most cases the resurgence of resistance to insecticides is due to the mismanagement of the factors available for controlling insects. Often, the lack of information about beneficial insects and their role in the agroecosystem results in underestimating their importance. Previous studies reported by Vargas-Camplis and Wolfenbarger (1994) and J. Vargas-Camplis (1995) record at least five different species of Hymenoptera parasitoids.

A survey in the last five years indicates that among the main problems, the bollworm and tobacco budworm are important pests that can substantially reduce yield if natural enemies are not ensured.

Materials and Methods

In the Northern region of Tamaulipas Mexico, bollworm and tobacco budworm larvae were collected on a weekly basis from 1990 to 1995. Cotton fields where the larval collections were conducted were located mainly near the municipalities of Matamoros, Rio Bravo, Reynosa, Valle Hermoso and San Fernando (up to 100 miles below the Texas southernmost border. The collections started in mid-April but began to be more abundant in May (blooming time), and lasted until almost the end of the cotton season both in dryland and irrigated cotton. Larvae were reared in 20 ml plastic cups with 10 ml of artificial diet (Shaver and Raulston 1971). They were kept in a growth chamber at 30° C with 14 hours light. Bollworm and tobacco budworm were identified. Parasites obtained were recorded on a weekly basis to determine incidence and kept for identification purposes.

Cotton fields from San Fernando and Matamoros, dryland, and Matamoros, Rio Bravo, and Valle Hermoso Tamaulipas irrigated were sampled during the growing season for the presence of predators. The upper third of the plant was used for sampling purposes finding Hemipterans such as *Orius* sp., *Nabis* sp., and *Geocoris* sp. Colepterans such as *Hippodammia* sp, *Scimnus* sp., *Olla* sp, and Neuropterans such as *Chrysopa* sp.

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Results and Discussion

One of the main differences we found between this year (1995) compared with the previous five years was the amount of heat units needed for cotton development. This year more heat units were accumulated during May and June than the average for 1990-1994 (Table 2). This factor and the lack of rain caused dryland cotton to have a very short season and low height, affecting mechanical harvest as well as yield.

Results of data from 1990 to 1995 were very consistent on the presence of populations of tobacco budworm during the first fruiting weeks of cotton, (Table 3). Therefore it was very important to be careful with the timing for the use of chemical insecticides during the early growing season in order to avoid problems with resistance to different groups of insecticides.

Parasitism found in larvae of the bollworm complex during the season of 1995 revealed levels very similar to the average of 1990-95 (Table 6) that is above 40% throughout May.

In 1995 results from the predator survey revealed that hemipterans (minute pirate bug, big eyed bug, and damsel bug) are more abundant than coleop-terans that start higher than bugs until May 19. However, their population level was not higher than 10%. Green lacewing life stages were present under irrigated cotton conditions at the end of the season. They were mostly associated with areas with whitefly problems, such as northern and northwestern Rio Bravo. The predator population in dryland condition was very similar to the irrigated area (Tables 4 and 5).

Conclusions

Weather conditions during the 1995 cotton season were unusually, hot and dry. Populations of the tobacco budworm predominated during the first fruiting weeks of cotton. Based on our observation, sufficient predators and parasites were apparently present to maintain caterpillar pests below subeconomic levels throughout much of the 1995 cotton growing season.

References

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Table 1. Cotton Acreage in Northern Tamaulipas Mexico 1989-1995

Year	Irrigated ha	Dryland ha	Total ha
1989	916	578	1494
1990	5176	5063	10239
1991	52790	17583	70373
1992	5670	200	5870
1993	2138	1385	3523
1994	10292	12610	22902
1995	16378	23728	40116

Table 2. Heat unit for cotton during the growing season in Northern Tamaulipas

Date	Avg. 1991-94	1995
Feb. 15	39	91
Feb. 28	48	84
Mar. 15	75	38
Mar. 31	128	154
Apr. 15	123	119
Apr. 30	149	271
May 15	158	202
May 31	182	412
Jun. 15	212	206
Jun. 30	215	400
Jul. 15	237	223
Jul. 31	244	485

Table 3. Seasonal fluctuation of tobacco budworm during the cotton season in Northern Tamaulipas Average of 1991-1995

Date	% Avg. 1991-1995
Apr. 11	89.0
Apr. 18	47.5
Apr. 25	100
May 02	89.5
May 09	91.8
May 16	95.0
May 23	77.5
May 30	52.3
Jun. 06	41.8
Jun. 13	41.5
Jun. 20	21.8
Jun. 27	28.3
Jul. 04	48.5
Jul.11	41.5
Jul. 18	61.0
Jul. 25	13.0
Aug. 01	55.5

Table 4 Seasonal fluctuation of predators during the cotton growing season in Irrigated cotton Northern Tamaulipas 1995

Date	% Col.	% Hemip.	% Chrysop.
Mar. 12	0.0	0.0	0.0
Mar. 24	0.0	0.0	0.0
Mar. 31	06	0.0	0.0
Apr. 07	0.2	0.1	0.0
Apr. 12	2.6	0.2	0.0
Apr. 21	2.7	0.0	0.0
Apr. 28	1.5	0.2	0.0
May04	5.1	0.2	0.0
May 10	18.5	1.5	0.0
May 15	1.6	11.8	0.2
May 19	11.3	8.7	2.9
May 26	5.5	35.8	1.7
May 30	7.6	34.7	6.7
Jun. 07	14.0	41.7	4.8
Jun. 15	16.1	28.0	16.7

Table 5 Seasonal fluctuation of predators during the cotton growing season in dryland cotton Northern Tamaulipas 1995

Date	% Col.	% Hemip.	% Chrysop.
Mar. 16	0.0	0.0	0.0
Mar. 28	0.0	0.0	0.0
Apr. 06	0.4	0.0	0.0
Apr. 11	1.8	0.0	0.0
Apr. 25	13.6	0.7	0.0
May 02	6.3	0.3	0.3
May 09	19.6	1.1	0.0
May 16	8.6	1.1	0.3
May 23	13.1	22.0	1.6
May 31	25.5	47.9	2.4

Table 6. Seasonal fluctuation of parasitoids of bollworm complex in cotton during the season in Northern Tamaulipas 1991-1995

Date	%Avg. 1991-95	%1995
Apr. 11	37.0	36.0
Apr. 18	59.5	---
Apr. 25	72.5	78.0
May 02	36.5	27.0
May 09	62.0	51.0
May 16	51.0	45.0
May 23	53.1	49.0
May 30	55.8	55.0
Jun. 06	55.1	64.0
Jun. 13	52.2	29.0
Jun. 20	23.0	42.0
Jun. 27	48.4	25.0
Jul. 04	24.5	42.0
Jul. 11	12.5	37.0
Jul. 18	14.3	16.0
Jul. 25	2.0	—
Aug. 01	15.0	20.0