SEASONAL ROLE OF NON-CROP GRASSES IN STEM BORER POPULATION DYNAMICS

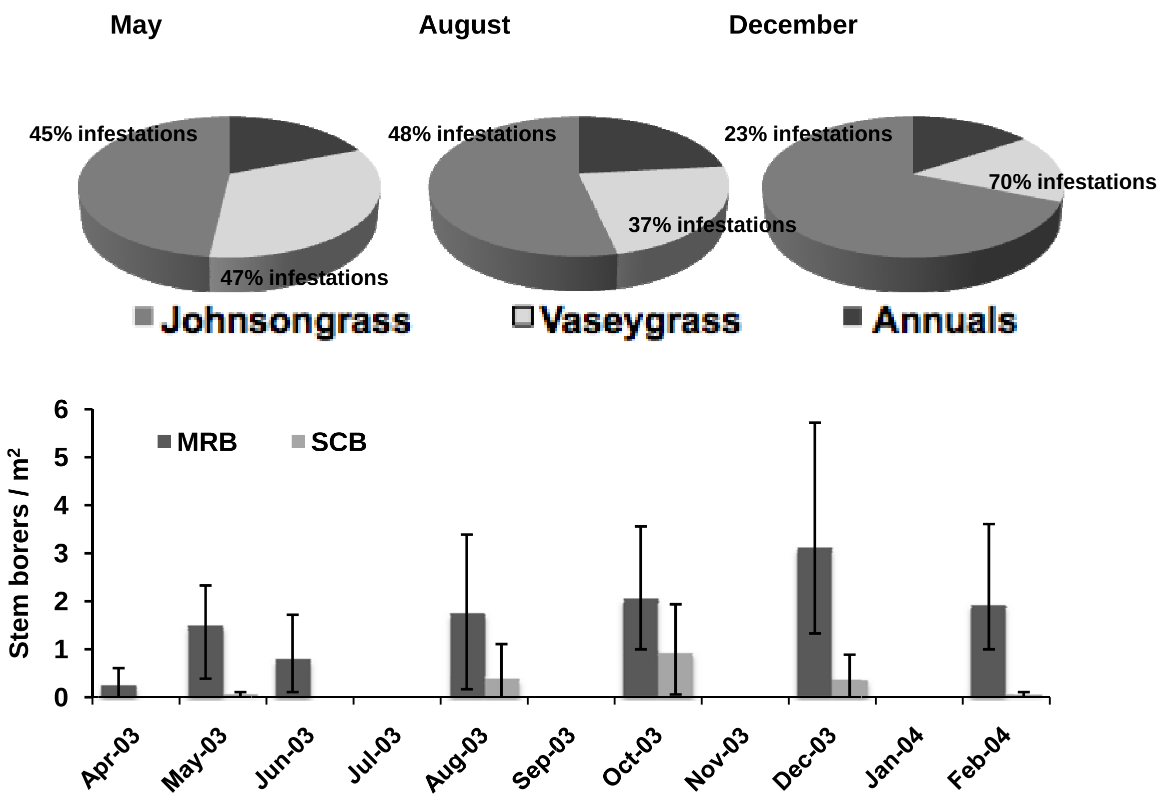
T. Eugene Reagan[1], Julien M. Beuzelin[1], Waseem Akbar[1], M.O. Way[2], and L.T. Wilson[2]
[1]Department of Entomology and [2] Texas A&M AgriLIFE Research Center at Beaumont

Non-crop habitat surveys were conducted for two-years, on a 6 to 8-week basis, to estimate stem borer natural infestations in weedy habitats throughout seasons. Three farms were selected in the upper (N 30.059°, W 94.279°), middle (N 29.855°, W 94.544°), and lower (N 29.027°, W 96.439°) Texas rice production area. On each farm, two transects were drawn along non-cultivated habitats field margins. On each date (7 dates per year), three random locations per transect were sampled, with three 1-m^2 quadrants randomly selected within a 10-m radius at each location. For each quadrant, grasses were cut at the soil surface level, identified, and their relative abundance visually estimated before dissection to recover stem borers. Mexican rice borer and sugarcane borer densities are reported in Figure 1.

Early in April, prevalent grasses were the perennial johnsongrass and vaseygrass, as well as the annual canarygrass, ryegrass, and brome. Vaseygrass harbored 60% of the stem borers, while none were found in johnsongrass. Late in May, the prevalent grasses were johnsongrass and vaseygrass (Figure 1), harboring 45% and 47% of stem borer infestations, respectively. At this time of the year, rice plants were still too small and did not host stem borers. Later in the season, the prevalent hosts were johnsongrass and vaseygrass, and to a lesser extent late annuals such as hairy crabgrass (Figure 1). Over the winter, stem borer highest densities were found in vaseygrass (Figure 1). This study shows that non-crop habitats have the potential to play a critical role in stem borer overwintering and population build-up during the spring.

This research is part of Ph.D. dissertation program of Julien Beuzelin

Figure 1. Non-crop grass availability in weedy field margins (pie charts) and associated seasonal average stem borer densities (bar chart). Error bars represent the farms with the highest and lowest average stem borer densities.



SMALL PLOT ASSESSMENT OF INSECTICIDES AGAINST THE MEXICAN RICE BORER

T. Eugene Reagan, Waseem Akbar, and Julien Beuzelin
Department of Entomology

Five different insecticide treatments, in addition to an untreated check, were assessed for season-long control of the Mexican rice borer (MRB) in a randomized complete block design with five replications in a field of stubble sugarcane (variety CP 72-1210) on the Joe Pennington Farms near Raymondville, TX. Insecticides were applied to 3-row plots (24-ft each) on 6 Jun, 1 Jul, 5 Aug, and 8 Sep, 2008 using a Solo backpack sprayer. MRB pheromone traps were placed next to the field and moth catches were counted weekly. In addition, when the moth counts exceeded an average of 20 per week, the farmer applied insecticide (Baythroid XL @ 2.8 oz/a) to the adjacent part of the experimental field and also to three additional CP 72-1210 nearby stubble fields (on 29 Aug). MRB injury to sugarcane was assessed from 15 randomly harvested stalks per plot (75 stalks/treatment) on 29 Oct. Fifteen stalks were also randomly sampled from the farmer's treated field next to the experimental plot. Stalks were sampled and then split using a stalk splitter machine to record the number of bored internodes penetrating inside the stalk and number of exit holes made by MRB prepupae. For each stalk, the total number of internodes and number of bored internodes outside the stalk were also recorded.

Minimum injury in insecticide treated plots was 1.9% bored internodes with all treatments significantly less than the untreated check of 16.2% bored internodes. Belt at 4.0 oz/acre rate showed a trend for the best MRB control (Table 1). There were large variations within treatments for entry and exit success. Differences were not detected for these parameters, suggesting generally that MRB escaping exposure to insecticide were able to bore inside, pupate, and exit from the stalks. This study highlights the potential importance of frequent scouting and proper timing in insecticide application for management of MRB. Also, the potential utility for using MRB pheromone traps in addition to small larval infestations scouting to assist with insecticide application timing is introduced for future research needs.

Table 1. Insecticidal control of the Mexican rice borer in a small plot test at Raymondville, TX, 2008.

Treatment[a]	Rate (oz/a)	% Bored Internodes [b]	% Entry Success[c]	% Exit Success[d]
Untreated Check		16.2 (2.4) a	48.2 (7.6)	18.6 (7.7)
Baythroid XL	2.8	4.9 (--) b	58.3 (--)	42.8 (--)
Diamond	12.0	4.8 (1.4) b	29.4 (10.4)	9.4 (9.4)
Baythroid XL	2.8	4.7 (1.8) b	23.7 (19.2)	0.0 (0)
Dermacor X-100	5.3	3.0 (1.5) b	31.7 (18.3)	0.0 (0)
Confirm	12.0	2.4 (0.8) b	26.7 (12.5)	16.7 (16.7)
Belt	4.0	1.9 (1.6) b	50.0 (28.9)	50.0 (50.0)

[a]Treatment was applied with a non-ionic surfactant at 0.25% v/v.
[b]Means within column followed by the same letter are not significantly different ($P \geq .05$, Tukey's HSD).
[c]the number of bored internodes inside the stalk/number of bored internodes outside the stalk.
[d]the number of moth exit holes/number of bored internodes inside.

ASSESSMENT OF VARIETAL RESISTANCE TO THE SUGARCANE BORER AND MEXICAN RICE BORER

T. Eugene Reagan[1], M.O. Way[2], Julien Beuzelin[1], and Waseem Akbar[1]
[1]Department of Entomology and [2] Texas A&M Research and Extension Center at Beaumont,TX

Sugarcane resistance to the sugarcane borer (SCB), *Diatraea saccharalis*, and Mexican rice borer (MRB), *Eoreuma loftini*, is categorized as a combination of physical characteristics that hinder boring (i.e. rind hardness, leaf-sheath appression), variety specific tolerance to boring, and antibiosis mechanisms that contribute to differences in survival of larvae that have bored into the stalks. However, the single greatest component of resistance to the MRB relates to characteristics of plant vigor minimizing leaf senescence and attractiveness for egg laying. The extent of this resistance also is influenced by the severity of infestations. Heavy borer pressure results in more bored internodes even in varieties considered highly resistant. Several factors contributing to seasonal area-wide SCB and MRB infestation levels include weather conditions, predator and parasite numbers, indigenous borer populations, effectiveness and timing of insecticidal controls. Expansive acreage of varieties with elevated moth production increases endemic SCB and MRB populations and imposes additional pressure on the remaining acreage of more resistant varieties. A minimal component in the practice of host plant resistance in entomology involves the encouragement of breeding programs to release varieties with insect resistance at least comparable to those varieties being commonly grown. This is particularly important when there is evidence that the susceptible variety has the potential to enhance pest populations.

Nine sugarcane cultivars (HoCP 85-845, L 99-233, L 01-299, L 03-371, HoCP 04-814, HoCP 04-838, HoCP 04-847, L 05-457, L 05-459) were evaluated for resistance to the MRB in a RCBD with five replications in Ganado, TX. For borer injury assessment, fifteen sugarcane stalks per plot were randomly selected and dissected on August 18-20, 2008. Data were recorded from experimental varieties that were still in the program. Differences were not detected among cultivars with L 03-371 (37% bored internodes) showing a trend for being the most susceptible and L 01-299 (20% bored internodes) with a trend for more resistance (Table 1). L 03-371 seemed to be the most resistant cultivar in the 2007 cultivar screening test; however, during 2008 this cultivar did not maintain the expected resistance level. This may be attributed largely to the difference in rainfall (higher in 2007), in addition to a later fertilization regime. The average rainfall during April to August 2007 was 4.44 inches, whereas in 2008 there were 2.05 inches of rain for the same time period. It is likely that more frequent rains in May, June, and July of 2007 might have rendered sugarcane less stressed, which could have contributed to the observed resistance in L 03-371 in 2007 data collection. This inconsistency in results for the same cultivar may signify the importance of climatic factors such as rain in the ecology of a plant stress-related insects like the MRB.

Seven sugarcane varieties which remain in the variety development program were evaluated for their susceptibility to the sugarcane borer (SCB) at Burns Point, St. Mary Parish. Cultivars were planted in a RCB design with four replications for each variety. Plots for each variety were 10ft with a four ft gap. The varieties were planted on November 2, 2007. At the end of the season (November 25, 2008), twelve stalk samples were harvested from each plot and the number of SCB bored joints recorded. Significant differences among varieties were detected with HoCP 85-845 showing the least injury (19%). The highest injury was recorded in HoCP 05-904 with 62% bored internodes. Among the experimental varieties, the least injury was recorded in L 06-023 (Table 2).

Table 1. Mexican rice borer injury in plantcane during 2008, Ganado, TX. Test was planted November 13, 2007, and samples harvested on August 18-20, 2008.

Variety	% Bored Internodes (+SE)
L 01-299	20.4 (6.6) a
L 99-233	22.2 (6.9) a
HoCP 85-845	23.5 (7.2) a
HoCP 04-838	27.9 (8.0) a
L 03-371	36.9 (9.2) a

Means followed by the same letter are not significantly different ($P \leq 0.05$; Tukey's HSD).

Table 2. Sugarcane borer injury in plantcane during 2008, Burns Point, St. Mary Parish. Test was planted November 2, 2007, and samples harvested on November 25, 2008.

Variety	% Bored Internodes (+SE)
HoCP 85-845	18.9 (1.5) a
L 06-023	28.0 (5.3) b
HoCP 91-555	30.4 (6.7) b
L 06-040	33.7 (6.0) bc
L 06-038	34.5 (3.7) bc
L 97-128	35.9 (9.6) bcd
HoCP 05-961	35.5 (4.4) bcd
HoCP 05-918	41.2 (5.7) cd
HoCP 05-902	43.4 (2.4) d
HoCP 05-904	62.3 (10.8) e

Means followed by the same letter are not significantly different ($P \leq 0.05$; Tukey's HSD).

Acknowledgment: The sugarcane entomology program would like to express appreciation for help from other members of the sugarcane variety development and breeding program for their assistance in cutting the seed-cane, and helping to select the varieties for evaluation. Additionally, Dr. W. H. White (USDA-ARS) provided the USDA varieties used in these studies, in addition to providing other technical support.

MONITORING MEXICAN RICE BORER MOVEMENT

T. Eugene Reagan[1], M.O. Way[2], R. Pearson[2], Julien Beuzelin[1], Waseem Akbar[1], and L.T. Wilson[2]
[1]Department of Entomology and [2] Texas A&M AgriLIFE Research Center at Beaumont

Cooperative studies on the Mexican rice borer (MRB), *Eoreuma loftini* (Dyar), between the LSU AgCenter, the Texas A&M University research station at Beaumont, the Texas Department of Agriculture and the Louisiana Department of Agriculture and Forestry were conducted to monitor the movement of this insect towards Louisiana and to study the population dynamics of this devastating pest of sugarcane that cannot be easily controlled with insecticide applications. The MRB has been the major economic pest in Texas sugarcane since it established in 1980, quickly surpassing the pest severity of the sugarcane borer, *Diatraea saccharalis* (F.).

A major monitoring effort has been on-going since 2000 with the various cooperating agencies as well as with the assistance from farmers, county agents, and consultants. After the discovery in Brazoria, Colorado, Fort Bend, Waller and Wharton Counties in 2000, Harris and Austin Counties in 2001, Galveston in 2002, Chambers and Liberty in 2004, a new county was documented with MRB invasion (Jefferson) in 2005 (Fig. 1). Monthly totals for the eastern Texas rice counties for 2008 are included in Table 1. As previously anticipated, MRB spread into Louisiana by the end of 2008, and was collected in two traps near rice fields northwest of Vinton, LA on December 15. Trapping data from newly invaded counties in Texas indicates that each year infestations were initially low, but consistently increased the following year (Table 2). The same is expected in western Louisiana.

Extensive attempts involving several million dollars in classical biological control research to introduce MRB parasites have not resulted in effective MRB suppression in the Lower Rio Grande Valley of Texas. In our program, alternative control methods involving varietal resistance and cultural practices were investigated. In a field experiment in 2006, the newly released varieties L99-226 and L99-233 suffered 39.7 and 41.8% bored internodes, respectively. Based on results for the last several years**,** moderate levels of resistance are recorded in HoCP 85-845 (27 and 24% bored internodes in 2006 and 2008 tests, respectively, at Ganado, TX). Our work for the last several years on this devastating pest has emphasized the importance of using multiple tactics in combination to manage this pest, which will be necessary to the American Sugar Cane League for grants to the LSU Sugarcane Entomology program in partial support of this work, also supported by national USDA competitive grants and collaboration with county agents and agricultural consultants.

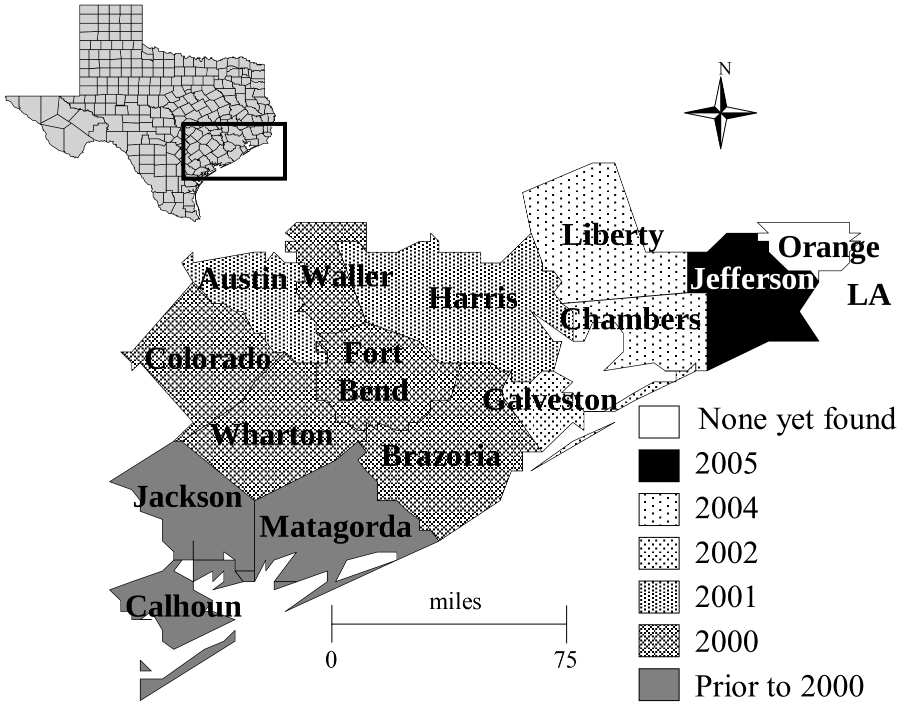


Fig. 1. Movement of the Mexican rice borer through the East Texas rice and sugarcane area, 2000-2006.

Table 1. Monthly totals of MRB adults from pheromone traps on the Texas Upper Gulf Coast in 2008.[1]

	County				
Month	Chambers	Colorado	Jackson	Jefferson	Orange
January	5	NA	NA	0	NA
February	2	NA	NA	0	NA
March	62	NA	NA	5	NA
April	68	NA	165	6	NA
May	237	NA	293	32	NA
June	368	89	153	28	0
July	894	162	245	48	0
August	972	308	475	64	0
September	65	620	585	6	0
October	2193	1056	705	388	NA
November	2259	517	162	280	NA
December	227	NA	NA	37	NA

[a]NA = collections not compiled for this month
September collections affected by Hurricane Ike (Jefferson and Orange Counties)
[1]Number of moths per two traps per month.

Table 2. Pheromone trap collections (April to November) of MRB moths in Southeast Texas from 2003-2008, i.e. MRB range expansion.

Texas counties	2003	2004	2005	2006	2007	2008
Liberty	0	413	1586	8672	2090	**-**
Chambers	0	6	3843	7321	4165	**7056**
Jefferson	0	0	5	239	717	**852**

-samples lost due to Hurricane Ike destroying extension center, reduced other samples.

FIELD EVALUATION OF CURRENT SUGARCANE GERMPLASM FOR RESISTANCE TO SUGARCANE APHID AND YELLOW SUGARCANE APHID

T. Eugene Reagan[1], Waseem Akbar[1], Julien M. Beuzelin[1], and Kenneth Gravois[2]
[1]Department of Entomology and [2]Sugar Research Station

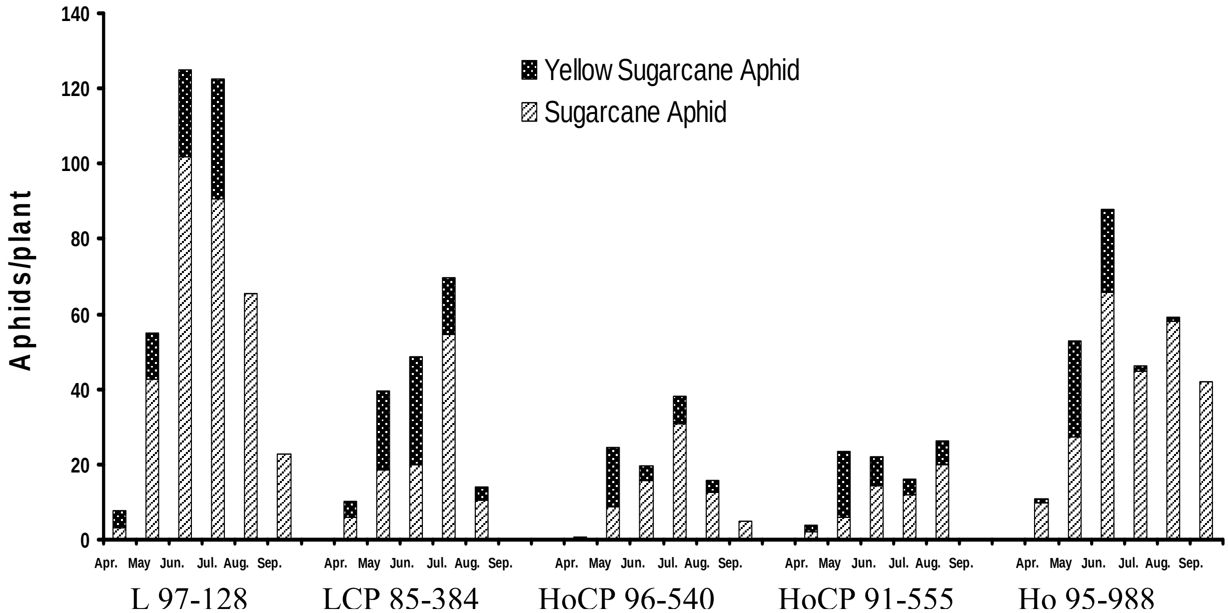
Population trends of the sugarcane aphid and yellow sugarcane aphid were monitored biweekly in 5–replication field plot tests of sugarcane cultivars LCP 85-384, HoCP 91-555, Ho 95- 988, HoCP 96- 540, and L 97-128. These cultivars were planted in single row plots (24 ft) in a randomized complete block design on August 15, 2006, near Youngsville, LA. Data on aphids were collected biweekly from April through September 2007, and April through August 2008 on 10 randomly selected plants from each plot.

The yellow sugarcane aphid was more abundant early in the season (April through May) on all cultivars except on Ho 95-988 for both plant and stubble cane. By late May and onward, more sugarcane aphids were recorded on all cultivars. The total aphid population was very low early in the season with a maximum of 10.95 aphids per plant on Ho 95-988 in April, 2007. At this time, L 97-128 had only 7.8 aphids/plant. However, the rapid increase in aphid numbers on this cultivar peaked at 124 aphids per plant in June 2007. Stubble cane always had higher aphid numbers than plantcane on all cultivars. Unlike plantcane where L 97-128 had the maximum number of aphids per plant, stubble Ho 95-988 had the highest numbers of aphids throughout the season with a peak of 300 aphids per plant in June 2008. In both plant and stubble cane, the peak aphid populations were recorded in June and July. HoCP 91-555 was the most resistant cultivar throughout the season for both plant and stubble cane. Based on two years of field data, L 97-128 and Ho 95-988 are concluded as relatively aphid susceptible cultivars, LCP 85-384 moderately resistant, and HoCP 91-555 and HoCP 96-540 as relatively resistant cultivars. These results are presented in Fig. 1.

This research is part of Ph.D. dissertation program of Waseem Akbar.

Fig. 1. Total number of aphids per plant on different sugarcane cultivars- plantcane data 2007 (a), stubble cane data 2008 (b), Youngsville, LA.

1a.



1b.