VARIETAL RATINGS FOR WEST INDIAN CANEFLY RESISTANCE

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In 2012, West Indian canefly populations soared in Louisiana causing significant yield losses. Insecticides containing imidacloprid were made available via a Section 18 crisis exemption that was made available through the Louisiana Department of Agriculture and Forestry. Many in the research and consulting community sought to collect information pertaining to West Indian canefly infestations in 2012. These sugarcane variety ratings are but one of these efforts.

Infestations of the West Indian canefly were particularly high in St. Mary, Vermilion, and St. Martin parishes. The Louisiana sugarcane breeding program has variety trials at the farm of Mike Melancon in Henderson, LA. The plant-cane nursery was rated for coverage of sooty mold, an indirect product of West Indian canefly infestations. The rating scale was done on a scale of 1 – 9, with a rating of 1 indicating canopy coverage of 0-10 percent and a rating of 9 indicated canopy coverage of 90-100 percent. The ratings were done on August 24, 2012 in the plant-cane nursery, which consisted of five commercial sugarcane varieties and 28 experimental clones representing the 2010 assignment series. The trial was replicated twice. Ratings were done without reference to variety designation (blind rating).

Data were analyzed with SAS (ver. 9.2) software. Replication was considered a random effect; variety was considered a fixed effect. Least square means were estimated and tested for statistical significance (P=0.05) with the PDIFF option of PROC MIXED.

Table 1. Ratings of sugarcane varieties for resistance to the West Indian canefly. Data were obtained from a plant-cane nursery variety trial at the farm of Mike Melancon in Henderson, LA in 2012.

Variety	West Indian Canefly Rating[1]	Letter Group[2]
HoCP96-540	7.0	abc
L99-226	6.0	bcde
L01-299	4.0	fghi
L03-371	7.5	ab
HoCP04-838	5.0	defg
L08-730	6.0	bcde
L10-132	7.0	abc
L10-133	2.5	i
L10-138	5.5	cdef
L10-141	8.0	a
L10-142	3.5	ghi
L10-144	5.5	cdef
L10-145	7.5	ab
L10-146	6.0	bcde
L10-147	6.0	bcde
L10-148	6.5	abcd
L10-150	6.0	bcde
L10-151	7.0	abc
L10-156	7.5	ab
L10-163	8.0	a
HoCP10-900	6.0	bcde
HoCP10-901	7.0	abc
Ho10-908	4.0	fghi
HoCP10-909	6.0	bcde
Ho10-912	6.0	bcde
Ho10-915	6.0	bcde
HoCP10-917	6.5	abcd
Ho10-922	4.5	efgh
Ho10-925	5.5	cdef
Ho10-927	7.0	abc
Ho10-931	5.0	defg
Ho10-937	6.0	bcde
HoL10-938	3.0	hi

[1] Ratings based on 1-9 scale where a rating of 1 indicated 1-10 percent canopy coverage; a rating of 9 indicated 90-100 percent canopy coverage.

[2] Means followed by the same letter are significantly different at the P=0.05 level.

ASSESSMENT OF INSECTICIDES AGAINST A COMPLEX OF HEMIPTERAN PESTS IN SUGARCANE, 2012

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Five insecticides were evaluated for control of the sugarcane aphid (SA), *Melanaphis sacchari* (Zehntner); yellow sugarcane aphid (YSA), *Sipha flava* (Forbes); and West Indian canefly (WIC), *Saccharosydne saccharivora* (Westwood), in a field of sugarcane cultivar HoCP 96-540, 1st stubble, located near Cheneyville, LA (Rapides Parish). The experiment was arranged following randomized complete block design with 4 blocks and 4-row plots (25 ft each).

Pest levels were assessed by counting SA, YSA, and WIC on the 3rd or 4th leaf down from the whorl on 4–5 randomly selected plants on each of the two center rows of each plot. Pre-treatment data collection was conducted on 23 July, 2012. On 24 July, insecticides were applied using a CO_2-pressurized backpack sprayer calibrated to deliver 10 GPA at 30 PSI. A 2-row boom equipped with eight TeeJet TP11001VS nozzles spaced 18 inches was used to spray insecticides approximately 2 ft above the canopy. No rainfall was recorded within 48h of treatment applications. Insecticide efficacy was evaluated 4 days after treatment (DAT). Data were analyzed using a linear mixed model (Proc GLIMMIX, SAS Institute) with means separated using Tukey's test ($\alpha = 0.05$).

Differences were not detected among pre-treatment counts. All insecticide treatments had 52–99% fewer WIC nymphs than the untreated check 4 DAT. All treatments except Transform had fewer WIC nymphs than untreated check 12 DAT. Reductions in YSA densities in Transform, Admire Pro and Besiege treatments had occurred 4 DAT, and no YSA were observed in Transform treatments 12 DAT. Baythroid XL and Besiege did not control SA. However, treatments with imidacloprid (Admire Pro, Leverage 360) substantially reduced SA infestations 4 DAT (79 and 81%, respectively). Transform provided the best control, with 97 and 99.5% reductions in SA densities at 4 and 12 DAT, respectively. Substantial reductions in densities of WIC, YSA, and SA populations had occurred in all plots by 24 DAT, and no differences were detected between treatments at this date. Hemipteran pest outbreaks in sugarcane are sporadic. Pyrethroids and pre-mixes with pyrethroids, which contain a sugarcane borer insecticide in addition to the pyrethroid, are currently labeled for hemipteran pest management. In addition, population crashes may occur without insecticidal control. Due to severe infestations of WIC in 2012, insecticides containing imidacloprid are expected to receive a Section 18 emergency exemption label for use in controlling this pest.

Treatment/Formulation*	Rate / acre	Pre-treatment (no. per leaf)			4 DAT (no. per leaf)			12 DAT (no. per leaf)			24 DAT (no. per leaf)		
		WIC	YSA	SA	WIC	YSA	SA	WIC	YSA	SA	WIC	YSA	SA
Untreated check	--	2.6	11.4	433.4	7.3a	14.5ab	334.6a	6.02a	2.48a	69.8abc	0.45	0.00	2.68
Transform WG	1.5 oz	6.3	14.5	382.2	3.5b	0.6b	8.9b	4.10a	0.0b	0.33c	0.63	0.00	0.18
Baythroid XL	2.1 fl oz	3.6	16.7	372.2	2.0b	21.8a	302.5a	0.33b	2.05ab	108.9ab	0.23	0.00	2.18
Besiege	9.0 fl oz	4.0	23.3	457.0	0.7b	4.6b	271.4a	0.05b	0.82ab	126.6a	0.05	0.03	1.63
Admire Pro	1.3 fl oz	6.2	7.3	463.9	0.3b	3.6b	71.4b	0.03b	0.03b	0.53c	0.00	0.00	0.53
Leverage 360	3.0 fl oz	5.9	17.6	434.4	0.0b	9.4ab	65.2b	0.03b	0.80ab	12.5bc	0.00	0.00	0.40
	F value	1.31	2.11	0.73	11.28	5.57	31.84	16.14	3.70	6.30	1.08	1.00	0.63
	P value	0.306	0.083	0.608	<0.001	0.001	<0.001	<0.001	0.007	0.002	0.409	0.419	0.678

*All insecticide treatments were applied using the nonionic surfactant Induce at 0.5% v/v.
Means within columns followed by the same letter are not different (P > 0.05, Tukey's test).

DENSITY-DEPENDENT YIELD-LOSS BY THE MEXICAN RICE BORER IN SUGARCANE, ENERGYCANE, AND ENERGY SORGHUM

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The Mexican rice borer (MRB), *Eoreuma loftini*, is an invasive stem-borer, which poses a threat to crops grown for biofuel production in the Gulf Coast Region. An experiment was conducted in 2012 at the Texas A&M AgriLIFE Research and Extension Center in Beaumont, Texas to evaluate yield-loss by the MRB among varieties of sugarcane, energycane, and energy sorghum. Two sugarcane varieties (HoCP 04-838 and HoCP 85-845) and two energycane varieties (L 79-1002 and HoCP 02-113) were evaluated. Two high-biomass sorghum varieties (ES 5200 and ES 5140) and one sweet sorghum variety (M81E), which have potential for biofuel production, were also evaluated. The experiment was arranged using a split-plot design with four replications. Replications consisted of seven, 3-row plots (72 ft long, 1.6 m row spacing). Crop varieties were randomized to plot. Plots were further divided into four, 3-row subplots (18 ft long) and subjected to one of four MRB infestation levels: suppressed infestation (biweekly applications of tebufenozide), natural infestation, enhanced infestation, and highly-enhanced infestation. To achieve enhanced infestation levels, MRB egg masses (~30 eggs) were clipped to the basal leaves of each plant consistent with natural oviposition behavior. Ten stalks samples were collected from each subplot at the end of the season and the no. bored internodes and emergence holes were recorded. Stalks were weighed, crushed, and juice was analyzed to estimate sugar yield and theoretical ethanol output. Theoretical ethanol output was calculated using methods described by Vasilakoglou et al. (2011).

Differences were detected in the percentage of bored internodes across variety, infestation level, and variety by infestation level (Table 1). Tebufenozide applications were successful in suppressing injury to < 1.0% bored internodes in all subplots subjected to control infestation levels. In subplots with highly-enhanced infestations, the percentage of bored internodes ranged from 9.1–26.8%, with varieties of energycane (L 79-1002 and HoCP 02-113) and sweet sorghum (M81E) expressing higher levels of resistance. In terms of yield, differences in wet weight per stalk were detected across varieties and infestation levels. Higher infestations were associated with a decrease in wet weight for all varieties. A negative impact in yield was also evident in terms of theoretical ethanol production, as decreases in ethanol productivity were observed with enhanced infestations. In highly-enhanced infestations, decreases in ethanol production ranged from 12–42% when compared to suppressed subplots. For both conventional and bioenergy varieties, maximum ethanol productivity was achieved in MRB-suppressed subplots.

Results from this study demonstrate that the MRB has potential to reduce yield in bioenergy crops. Stemborer IPM practices will need to be implemented into bioenergy cropping systems in order to reduce yield-losses under high borer pressure.

Table 1. Mexican rice borer injury and yield parameters for sugarcane, energycane, high-biomass sorghum, and sweet sorghum varieties with varying infestation levels (1=control, 2=natural, 3=enhanced, 4=highly-enhanced). Replicated field trial, Beaumont, TX, 2012.

Variety	Infestation Level	Percent Bored Internodes	Weight (kg)/Stalk	Theoretical Ethanol Output (L ha)
Energycane L 79-1002	1	0.0	0.54	26882.0
	2	4.0	0.33	16485.0
	3	13.0	0.27	18658.0
	4	9.4	0.29	19931.0
Energycane HoCP 02-113	1	0.0	0.35	23008.0
	2	2.7	0.34	20456.0
	3	6.0	0.27	17755.0
	4	10.3	0.23	19815.0
Sugarcane HoCP 04-838	1	0.1	0.71	15041.0
	2	18.1	0.64	12765.0
	3	28.4	0.52	12323.0
	4	21.9	0.43	10478.0
Sugarcane HoCP 85-845	1	0.7	0.79	9396.4
	2	5.8	0.58	7725.9
	3	26.8	0.46	7201.4
	4	22.1	0.42	7978.5
High-biomass Sorghum ES 5200	1	0.0	0.66	41997.0
	2	23.5	0.59	25758.0
	3	10.9	0.54	31471.0
	4	26.8	0.52	30501.0
High-biomass Sorghum ES 5140	1	0.0	0.33	21538.0
	2	13.2	0.26	14413.0
	3	12.0	0.23	13413.0
	4	19.4	0.23	14675.0
Sweet Sorghum M81E	1	0.5	0.28	16920.0
	2	11.4	0.22	11754.0
	3	7.2	0.14	10835.0
	4	9.1	0.17	9922.6
Type III Test of Fixed Effects	Variety	$F = 3.29$ $P = 0.0230$	$F = 20.06$ $P < 0.0001$	$F = 28.86$ $P < 0.0001$
	Infestation Level	$F = 31.31$ $P < 0.0001$	$F = 27.28$ $P < 0.0001$	$F = 18.59$ $P < 0.0001$
	Variety* Infestation Level	$F = 2.71$ $P = 0.0019$	$F = 1.41$ $P = 0.1579$	$F = 1.49$ $P = 0.1251$

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AERIAL INSECTICIDAL CONTROL OF MEXICAN RICE BORER IN SUGARCANE
RIO GRANDE VALLEY, TX. 2012

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Evaluation of aerial application control of the Mexican rice borer (MRB), *Eoreuma loftini,* in sugarcane was conducted in the Rio Grande Valley (Cameron and Hidalgo Counties) of Texas in 2012. Insecticide treatments were randomly assigned to plots (8-10 acres/plot) in commercial sugarcane fields of variety CP 72-1210. Pheromone traps were used to monitor MRB populations throughout the growing season. Larval scouting was conducted by examining 100 stalks in each field on 21 Aug 2012 and revealed that infestations exceeded the threshold of 5% of stalks with treatable larvae on plant surfaces. The aerial application was made the morning of 22 Aug by fixed wing aircraft flying at 145 mph. All treatments were applied with 10 gallons of water per acre.

MRB injury data were collected on 29 Oct 2012 from 15-stalk samples taken from 2 locations in each test plot. Differences between treatments were detected for both percent bored internodes and adult emergence per stalk (Table 1). Mean percent bored internodes ranged from 3.36% (Belt®) to 12.64% (untreated), and mean emergence ranged from 0.13 (Prevathon®) to 0.46 (untreated). Percent bored internodes in Belt and Prevathon treated plots was significantly lower than in untreated controls. However, only Prevathon treatments significantly reduced adult emergence per stalk. Yield data were collected by the core sampling method and all plots were harvested completely. Two replications were harvested on 19 Dec 2013, one 8 Feb 2013, and two on 17-20 March, 2013. None of the treatments had significantly higher yield than untreated controls (Table 1). Yield was highest in Belt® treated plots and lowest in Confirm® treated plots. Further MRB injury received in treated plots after bored internode data was collected in October is a potential explanation for the lack of differences in yield despite having reduced injury in treated plots. The MRB remains active throughout the winter in the Rio Grande Valley. Data indicate that new diamide chemistries, Belt and Prevathon, may provide better control of the MRB than either Confirm® or Diamond®.

Table 1. Mexican rice borer injury and sugarcane yield. Aerial application trial, Cameron and Hidalgo Counties, TX. 2012.

Trade Name	Common Name	Rate (fl oz/acre)	% Bored	Emergence /stalk	Tons of Cane/Acre	Tons of Sugar/Acre
Untreated	NA	NA	12.64a	0.46a	40.36ab	4.64a
Confirm®	Tebufenozide	16.0	7.82ab	0.32ab	33.57b	3.77b
Diamond®	Novaluron	12.0	5.62ab	0.21ab	39.07ab	4.54ab
Prevathon®	Rynaxypyr	20.0	3.55b	0.13b	41.43a	4.54ab
Belt®	Flubendiamide	4.0	3.36b	0.22ab	43.26a	4.80a
		df =	4, 18.75	4, 20.62	4, 16.00	4, 16.00
		F =	6.21	2.98	4.48	4.23
		P=	0.0023	0.0432	0.0128	0.0159

*Means which share a letter are not significantly different (Tukey's HSD, α = 0.05)

EVALUATION OF SUGARCANE, ENERGYCANE, AND SORGHUM CULTIVARS FOR RESISTANCE TO THE MEXICAN RICE BORER, BEAUMONT, TX, 2012

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Host plant resistance is an important part of Mexican rice borer (MRB), *Eoreuma loftini* (Dyar), integrated pest management (IPM) due to limitations in chemical and biological control tactics. Resistant cultivars show low levels of MRB injury (percent bored internodes) and have potential to reduce area-wide populations. The effect of cultivars on area-wide populations is assessed by comparing the number of adult emergence holes. Research suggests resistant cultivars which impede stalk entry and prolong larval exposure on plant surfaces may enhance the efficacy insecticide applications. Additionally, host plant resistance has potential to reduce the input cost associated with alternative pest management strategies. Host plant resistance is of particular importance to bioenergy crops including energycane and high-biomass sorghum which are anticipated to be grown on marginal land with reduced input costs. Continued evaluation of stalkborer resistance is valuable to maintaining the success of stalkborer IPM.

Resistance to the MRB was evaluated in cultivars of sugarcane, energycane, and sorghum. Commercial sugarcane varieties included were HoCP 85-845 (resistant), HoCP 05-838 (susceptible), and Ho 05-961 (intermediate). Seven experimental cultivars from the sugarcane variety development programs at LSU and USDA-Houma included were L 08-088, L 08-090, L 08-092, Ho 07-613, Ho 08-709, Ho 08-711, and Ho 08-717. Five sugarcane cultivars commonly grown in the Rio Grande Valley of Texas (CP 79-1210, CP 89-2143, TCP 87-3388, TCP 99-4474, TCP 99-4480) were also evaluated. Cultivars with potential for bioenergy production include six energycanes (L 79-1002, Ho 02-113, Ho 07-9014, Ho 07-9017, Ho 07-9027, and Ho 07-9076), two energy sorghums (ES 5200 and ES 5140), and one sweet sorghum (M81E). A five replication field study was conducted at the Texas A&M AgriLIFE Center at Beaumont, TX. Test plots were 1-row (12 ft) arranged in a randomized block design. Sugarcane and energycane cultivars were planted 26 October 2011; sorghum was planted 19 April 2012. On 22 October 2012, twelve randomly selected stalks were collected from each plot and the total no. internodes, the no. bored internodes, and the no. emergence holes were recorded.

The sugarcane borer, *Diatraea saccharalis,* is present in the Beaumont area, however, the stem borer population was >90% MRB in 2012. The percentage of bored internodes and no. emergence holes per stalk were analyzed using generalized linear mixed models (Proc Glimmix, SAS Institute) with binomial and Gaussian distributions, respectively. Results show significant differences between cultivars (df = 23, 96; F = 14.46; P <0.0001) in percentage of bored internodes which ranged from 6.01 to 26.47% (Table 1). Differences were also detected in the no. emergence holes pre stalk (df = 23, 96; F = 3.05; P <0.0001) which ranged from 0.11 to 1.43 (Table 2). Consistent with results from previous evaluations, HoCP 85-845 was the least injured

(% bored) of all cultivars tested. Experimental cultivar, L 08-090, was the most susceptible in terms of both injury and adult emergence. All of the energycane cultivars demonstrated moderate to high levels of resistance. The three sorghum varieties demonstrated a high degree of susceptibility.

Table 1. Mexican Rice Borer Injury
Beaumont, TX, 2012

Cultivar	Crop	% Bored Internodes
L 08-090	SC	26.47
CP 79-1210	SC	22.80
M81E	SS	20.54
CP 89-2143	SC	19.29
Ho 08-717	SC	18.30
HoCP 05-838	SC	17.24
ES 5140	ES	16.81
Ho 05-961	SC	16.51
L 08-088	SC	16.35
ES 5200	ES	15.26
TCP 99-4474	SC	14.81
L 08-092	SC	14.47
Ho 08-709	SC	13.43
Ho 07-613	SC	13.38
Ho 08-711	SC	13.18
Ho 07-9014	EC	12.91
TCP 87-3388	SC	12.23
L 79-1002	EC	11.23
Ho 07-9017	EC	11.10
TCP 99-4480	SC	10.97
Ho 07-9027	EC	10.04
Ho 02-113	EC	9.55
Ho 07-9076	EC	9.03
HoCP 85-845	SC	6.01

Table 2. Mexican Rice Borer Moth
Production

Cultivar	Crop	Emergence Holes/Stalk
L 08-090	SC	1.43
L 08-088	SC	1.01
CP 79-1210	SC	0.98
ES 5200	ES	0.98
HoCP 05-838	SC	0.95
CP 89-2143	SC	0.87
M81E	SS	0.82
ES 5140	ES	0.77
Ho 05-961	SC	0.72
Ho 08-717	SC	0.70
TCP 99-4474	SC	0.67
Ho 08-711	SC	0.63
Ho 08-709	SC	0.55
Ho 07-613	SC	0.55
L 08-092	SC	0.47
TCP 99-4480	SC	0.46
Ho 07-9014	EC	0.32
TCP 87-3388	SC	0.28
Ho 02-113	EC	0.28
HoCP 85-845	SC	0.23
Ho 07-9027	EC	0.23
L 79-1002	EC	0.20
Ho 07-9076	EC	0.14
Ho 07-9017	EC	0.11

*SC = Sugarcane, EC = Energycane, ES = Energy Sorghum, SS = Sweet Sorghum
**Means which share a line are not significantly different (Tukey's HSD, α = 0.05)