Bt soybean does not affect feeding behavior of red-banded stink bug *Piezodorus guildinii* (Hemiptera: Pentatomidae)

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Introduction

Bt soybean represents 13% of the global area sowing with this crop[1]. Although the presence of Cry1A(c) expressed in Bt soybean efficiently controls different lepidoptera pests, the effect on non-target arthropods is of concern. *Piezodorus guildinii* is a major soybean pest throughout the Americas. It is known that Bt crops are not effective for its control, while sub lethal effects are unknown.

Objetive This study aims to determine the effect of Bt soybean on *P. guildinii* feeding behavior using an AC-DC electropenetrograph (EPG).

Methodology

Varieties compared:
- DM 59i (RR)
- DM 5958iPRO INTACTA™ (RR/Bt)

Adults females of *P. guildinii* were immobilized, wired in a electrode and individually connected to an EPG amplifier and placed on soybean pod of both varieties .

EPG feeding waveforms were obtained using a four-channel AC-DC monitor (EPG Technologies, Inc., Gainesville, FL) .
Each stink bugs were monitored undisturbed for an 15-h access period with continuous light.

Waveforms were characterization using an EPG waveform library of *P. guildinii*[2].
Means of different waveform parameters for each treatment (RR or RR/Bt) were analyzed by generalized linear models and Kruskal-Wallis (P-valor >0,05).

Results and discussion

Feeding behaviors recorded were classified in non-probing (Np) and probing waveforms. Ingestion phases (Pg) were composed by stylet penetration deep into plant tissue (Pg1), leaves, steams and pod xylem sap (Pg2), seed salivation (Pg3a) or endosperm ingestion (Pg3b)[2]. Figures 1 a-e respectively.

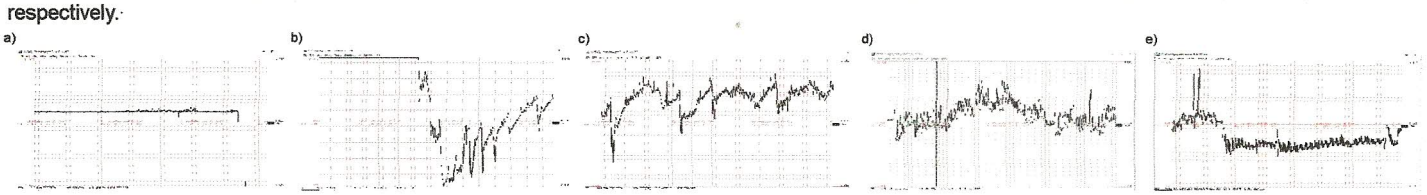

Figure 1. EPG waveforms measured using Windaq Waveform Browser (Dataq Instruments, Akron, OH): a) Np b) Pg1, c) Pg2, d) Pg3 e) Pg4.

It was estimated for each treatment (RR or RR/Bt): number of waveform events per insect (NWEI), waveform duration per insect per probe (WDPI) and total waveform per insect (WDI), WDPI standard deviation (WDPI SD), WDI coefficient of variation (WDPI CV) and waveform duration within the total recorded period (PRT) Table 1.

Table 1. Means and standar errors of different waveform parameters for each treatment (RR or RR/Bt):

		PRT*		NWEI*		WDPI**			WDPI SD**			WDPI CV**			WDI **		
		Mean	S.S.	Mean	SS	Mean	S.S.	p	Mean	S.S.	P	Mean	S.S.	p	Mean	S.S.	p
Np	non-Bt	83.7 A	4.9	4.0 A	0.3	14882.9	1912.1	0.177	19848.7	3211.7	0.152	132.3	11.9	0.717	45198.2	2092.5	0.395
	Bt	75.4 A	4.8	3.2 A	0.3	11648.0	1896.2		13064.5	2330.5		119	15.0		40708.5	2913.3	
Pg1	non-Bt	1.9 A	0.3	5.9 A	0.6	112.9	17.2	0.012	135.2	23.2	0.033	117.3	8.8	0.904	501.3	107.7	0.005
	Bt	0.9 B	0.2	4.6 A	0.7	177.1	14.9		218.2	26.5		124.9	11.1		1055.4	155.6	
Pg2	non-Bt	4.4 A	1.3	1.9 A	0.3	1370.3	316.8	0.157	1437.8	375.5	0.537	111.0	19.8	0.792	2383.1	525.5	0.455
	Bt	3.2 A	0.9	1.7 A	0.4	820.6	208.2		1015.6	447.6		91.4	26.2		1761.8	567.8	
Pg3a	non-Bt	17.9 A	4.2	69.4 A	23.2	201.5	58.0	0.953	367.3	79.6	0.955	137.8	13.9	0.088	5471.9	1815.2	0.337
	Bt	10.1 A	3.9	23.7 A	15.9	210.6	51.4		454.4	115.9		178.5	19.1		9669.5	2440.6	
Pg3b	non-Bt	1.4 A	0.4	67.2 A	23.0	12.1	4.6	>0.999	24.7	11.6	>0.999	176.9	24.4	0.699	275.3	121.3	0.477
	Bt	0.5 A	0.3	22.2 A	15.5	18.4	10.2		45.7	30.9		148.5	28.1		755.0	272.2	

* Means with differnets letter between treatment differ statistically (p <0.05, Tukey´s test) ** Waveforms with pvalue <0.05 differ statistically by Kruskall Wallis Test.

Differential feeding behaviors were only detected between the pathway phase (Pg1) at PRT, WDPI, WDPI SD, WDI and PRT, which could be associated to morphological differences between the varieties and not to the presence of Cry1A(c) endoprotein.
Food ingestion on leaves, stems or pod xylem (Pg2), seed endosperm ingestion (Pg3) and non-probing phases (Np) did not differ between treatments.

Conclusion

- These results suggest that RR/Bt soybean does not affect the feeding behavior of red-banded stink bug; therefore, its action thresholds would be the same as those used in non-Bt varieties.
- Complementary studies are being carried out to determinate possible RR/Bt soybean effect on biology, reproduction and farm abundance of *P. guildinii*.

References

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2. T Lucini, AR Panizzi, EA Backus. 2016. Characterization of an EPG waveform library for redbanded stink bug, *Piezodorus guildinii* (Hemiptera: Pentatomidae), on soybean plants Annals of the Entomological Society of America. *109*(2), 198-210.

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