

Contact toxicity, Electrophysiology, Anti-mating and Repellent effects of *Piper guineense* against *Spodoptera frugiperda* (Lepidoptera: Noctuidae)

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Supplementary Information

Table S1a. Statistical comparison of LC₅₀ values of *Piper guineense* extract on *Spodoptera frugiperda* larvae tested by topical application between days

Comparison across days	Estimate	Std. Error	t-value	p-value
1-2	3.69989	9.8652	0.3750	0.7109
1-7	3.88432	9.8759	0.3933	0.6976
2-7	0.18443	0.9821	0.1878	0.8526

LC₅₀ values were not significantly different ($p > 0.05$) across pairs of days.

Table S1b. LC₅₀ values of *Piper guineense* extract across days against *Spodoptera frugiperda* larvae tested by topical application

Time (Days)	LC ₅₀	95% CI
1	3.46	-15.22-25.43
2	0.86	0.14- 2.67
7	0.36	-0.36- 2.80

LC₅₀ values were not significantly different ($p > 0.05$) due to overlapping respective 95% CI. LC₅₀ = median lethal concentration; CI = confidence interval.

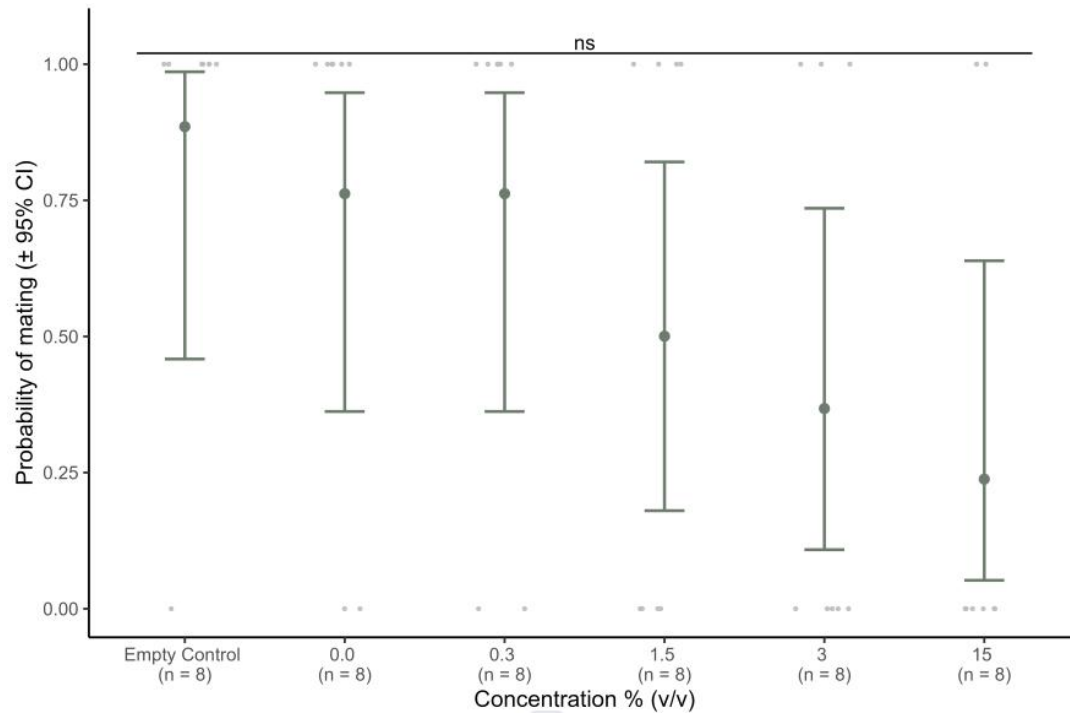


Figure S1: Probability of mating of *Spodoptera frugiperda* exposed to extract concentrations of *Piper guineense* extract. ns = mating probability not significant ($p > 0.05$). Grey dots indicate raw data.

Table S2. Contrast effects of extract concentration and population on oviposition. Contrasts are Tukey p -value adjustments after a significant interaction between population and extract concentration was found (GLMM: estimate = $-2.43 \pm 0.83se$, z -value. = -2.93 , $p = 0.003$). Values are given on a log scale as the initial model was fitted with a Poisson distribution. SFK = *Spodoptera frugiperda* Kenya; SFN = *Spodoptera frugiperda* Nigeria

Contrast	estimate	s.e	z-ratio	p-value
<i>SFK population</i>				
Empty Control - 0.0%	0.41	0.41	0.99	1.00
Empty Control - 0.3%	2.01	0.75	2.68	0.24
Empty Control - 1.5%	0.31	0.40	0.78	1.00
Empty Control - 3%	1.10	0.52	2.13	0.60
Empty Control - 15%	1.32	0.53	2.35	0.44
0.0% - 0.3%	1.61	0.77	2.08	0.64
0.0% - 1.5%	-0.09	0.44	-0.22	1.00
0.0% - 3%	0.69	0.55	1.27	0.98
0.0% - 15%	0.92	0.59	1.55	0.93
0.3% - 1.5%	-1.70	0.77	-2.22	0.53
0.3% - 3%	-0.92	0.84	-1.10	0.99
0.3% - 15%	-0.69	0.87	-0.80	1.00
1.5% - 3%	0.79	0.54	1.46	0.95
1.5% - 15%	1.01	0.58	1.74	0.85

	3% - 15%	0.22	0.67	0.33	1.00
<i>SFN population</i>					
Empty Control - 0.0%	0.66	0.31	2.15	0.59	
Empty Control - 0.3%	3.43	1.02	3.38	0.03	
Empty Control - 1.5%	2.74	0.73	3.76	0.009	
Empty Control - 3%	1.04	0.35	2.96	0.12	
Empty Control - 15%	2.34	0.60	3.87	0.006	
0.0% - 0.3%	2.77	1.03	2.69	0.23	
0.0% - 1.5%	2.08	0.75	2.78	0.19	
0.0% - 3%	0.37	0.39	0.96	0.99	
0.0% - 15%	1.67	0.63	2.66	0.24	
0.3% - 1.5%	-0.69	1.22	-0.57	1.00	
0.3% - 3%	-2.40	1.04	-2.30	0.48	
0.3% - 15%	-1.10	1.15	-0.95	1.00	
1.5% - 3%	-1.70	0.77	-2.22	0.53	
1.5% - 15%	-0.41	0.91	-0.45	1.00	
3% - 15%	1.30	0.65	2.00	0.70	

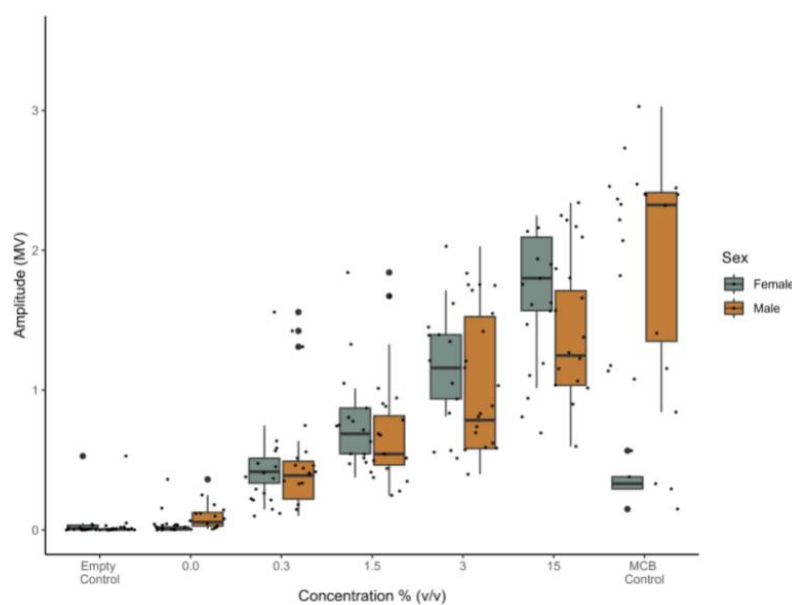


Figure S2: EAG responses of *Spodoptera frugiperda* males and female for combined SFK and SFK populations to extract concentration of *Piper guineense*. Box and whisker plots indicate amplitude response (in millivolts (mV)) of females (light grey) and males (orange). Extract concentrations of *P. guineense* are in percentage volume to volume (% (v/v)). The empty control represents negative control and the MCB (multiple component blends of the five pheromone compounds from a *S. frugiperda* female) represents a positive control. Sample sizes per sex: Female – Empty control and all concentrations (0.0% (v/v) - 15% (v/v)) = 13, MCB control = 5; Male – Empty control, all concentrations and MCB control = 18). Black dots indicate raw data.