

Insecticide resistance in rice stink bug and armyworms

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Insecticide Resistance

“a **heritable** change in the sensitivity of a pest population that is reflected in the **repeated failure of a product to achieve the expected level of control** when used according to the label recommendation for that pest species” – IRAC 2022

Insecticide Resistance

Factors influencing resistance development

Reproduction (generation time)

Host range

Proximity of susceptible populations

Insecticide use patterns

Insecticide modes of action

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Rice stink bug (RSB)



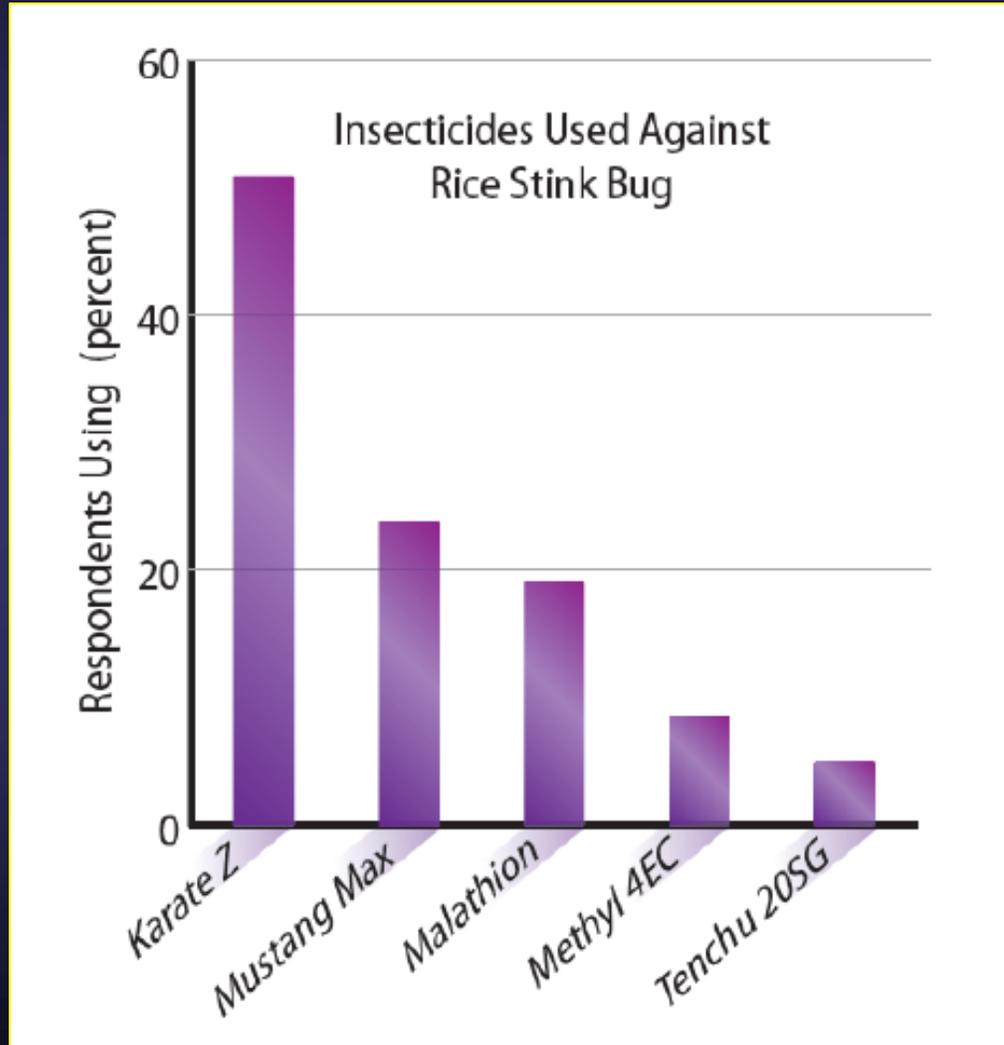
Oebalus pugnax

**Generation time: ≈21 days
from egg to adult**

**Crops: rice, sorghum,
wheat, barley, corn**

**Weedy grasses:
barnyardgrass, vaseygrass,
millet, broadleaf signal
grass, and others**

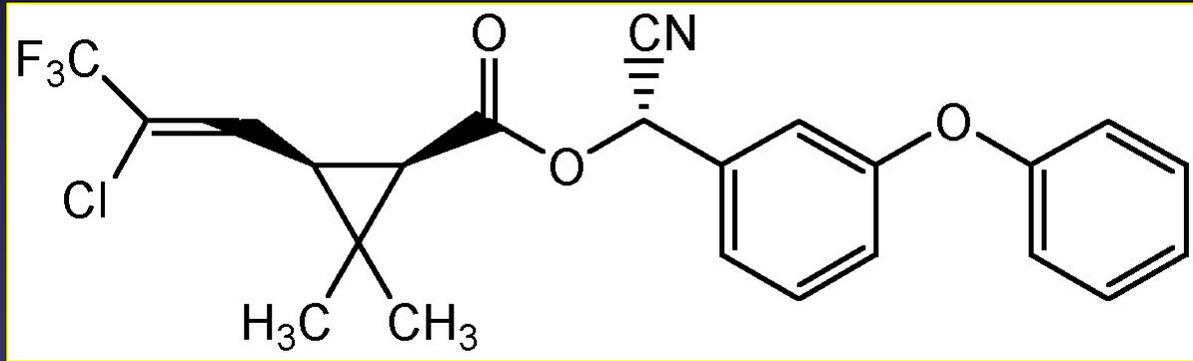
Lambda-cyhalothrin resistance in RSB



Lambda-Cy primary product for RSB for almost 15 years.

Survey results from 2008-2012 LA and TX (Blackman et al. 2014).

Lambda-cyhalothrin resistance in RSB



Pyrethroid - [3A] Sodium channel modulator
Fast knock down
Broad spectrum
Short residual
Non-systemic
Inexpensive and widely available

Lambda-cyhalothrin resistance in RSB

Table 2. Susceptibility of RSB populations to lambda-cyhalothrin in Mid-South rice production regions, 2009. Data from Cross (2016)

Location	LC₅₀ (µg)	95% CL	Resistance Ratio
Louisiana 2002	0.63	0.47–0.84	NA
Louisiana 2009	0.86	0.61–1.23	1.4
Arkansas 2009	0.53	0.27–0.99	0.8
Missouri 2009	0.65	0.34–1.34	1.0
Texas 2009	3.51	NA*	5.6

***Confidence limits not reported by Cross (2016)**

Lambda-cyhalothrin resistance in RSB

Field control

3-4 applications needed in some cases

Reports of adults re-infesting vs low nymph mortality

Efficacy trials

Small plot trials are often inconclusive

Most trials show efficacy against nymphs for 3-5 days

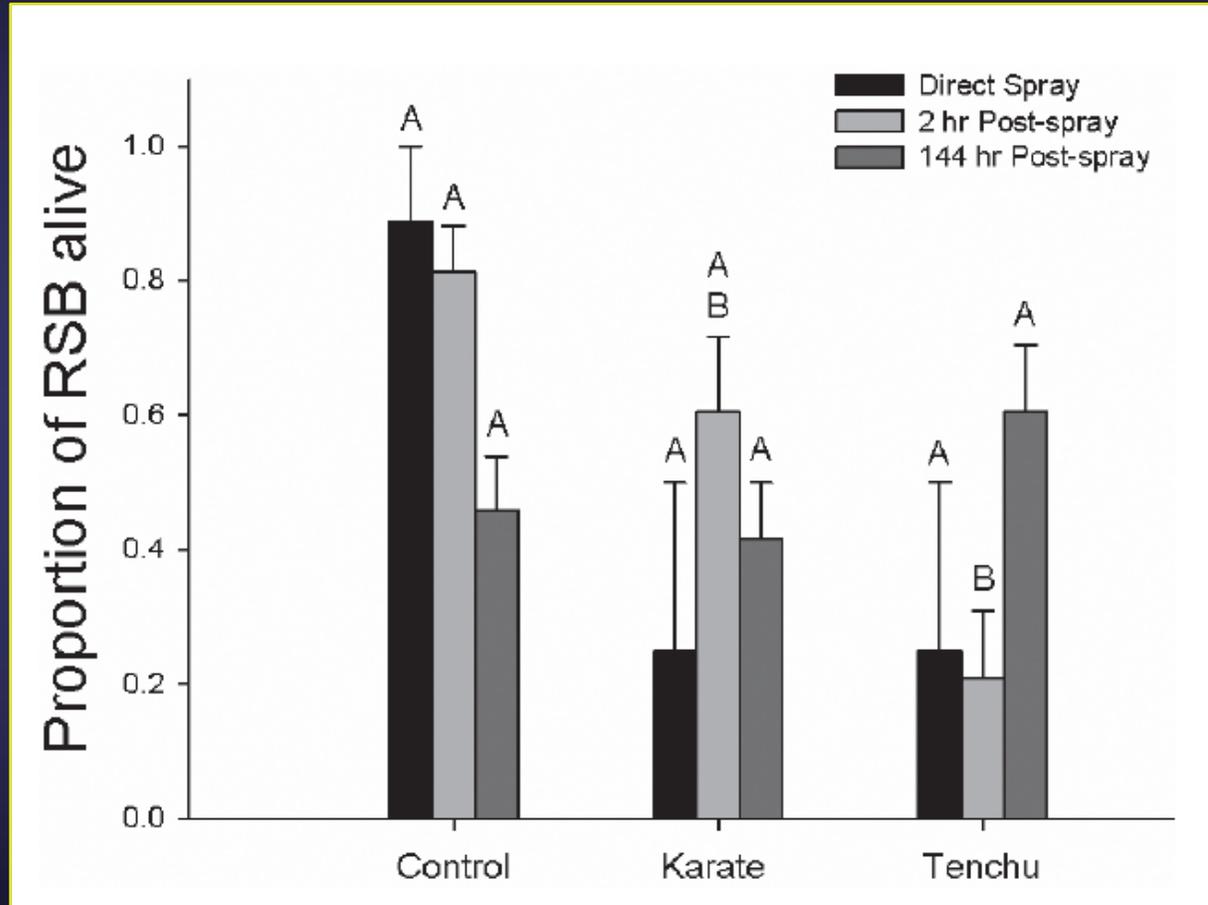
Poor efficacy against adults frequent across treatments

See Bateman et al., Blackman et al., others

When should efficacy be judged?

What are the expectations for control?

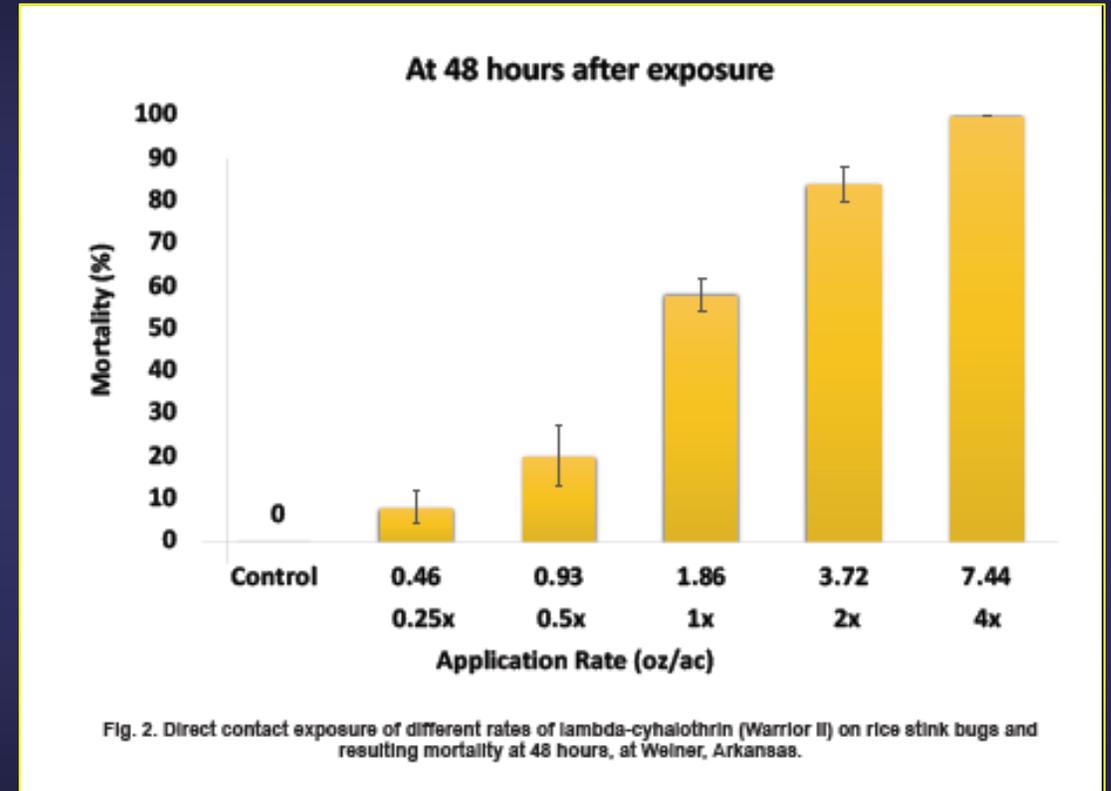
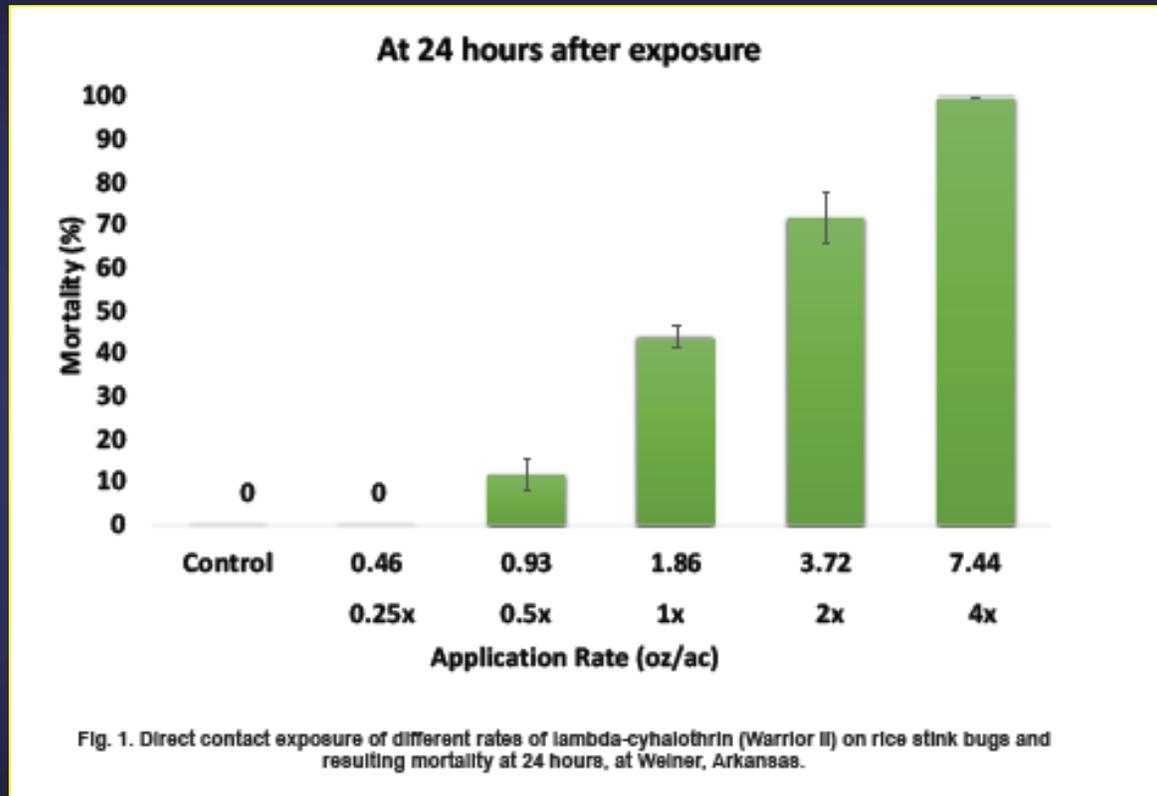
Lambda-cyhalothrin resistance in RSB



Reduced adult mortality on rice panicles (48 hour exposure) after just two hours.

From Blackman et al. 2015

Lambda-cyhalothrin resistance in RSB



From Lorenz, Bateman, et al. 2020
Adults from field control failure site

Lambda-cyhalothrin resistance in RSB

Toxicity assays needed

**Nymphs and adult vials assays from broad geographic region
If resistance is identified, implement alternatives**

Distinguishing resistance from re-infestation challenging

Repeated failures?

Expectations?

Lambda-cyhalothrin resistance in RSB

Tenchu (dinotefuran)

Neonicotinoid [4A]

More effective

Longer residual

Reduced need for multiple applications

MustangMaxx – similar issues as lambda-cy

Malathion – inconsistent efficacy, limited availability

Acephate – NOT LABELED. Export issues.

Imidacloprid – NOT LABELED.

Fall Armyworm

Spodoptera frugiperda



Photos by N. Hummel

Fall Armyworm

Spodoptera frugiperda



**Extremely broad host range,
crops and non-crop plants**

**Exposed to a broad range of
insecticides**

**Resistance to numerous classes
reported**

Fall Armyworm

Spodoptera frugiperda



“Corn” vs “rice/grass” strain

**Morphologically identical,
genetic analysis required for
identification**

**Corn strain more prevalent in
eastern regions, rice Mid-south**

Interbreeding occurs

Fall Armyworm

Lambda-cyhalothrin resistance

Target site resistance identified (McCormic et al. 2020)

Resistance ratios of >700 in corn strain

Cross resistance to other pyrethroids

Originally appeared in corn strain, may now be more widespread

Fall Armyworm

Lambda-cyhalothrin resistance

Poor control observed in 2021 rice, despite prevalence of grass stain

Poor control common in pasture

Resistance assays needed to confirm resistance vs poor efficacy

Fall Armyworm

Control strategies

Dermacor X-100 seed treatment is effective

More expensive than Neonics, but is justified

Emergency exemptions for foliar products in 2020

Vantacor?

Price concerns?

Infestations unpredictable

Thresholds need re-examined

Timing, size of larvae, et al.

Acknowledgements

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Louisiana rice research board

Questions?



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