7th Seed Congress of the Americas

Promoting Seed Business in the Americas

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INTEGRATED STRATEGIES TO EXTEND Bt CROPS DURABILITY

Julio César Fatoretto - Syngenta

SAA
Seed Association of the Americas

Current Scenario of Bt Crops (Corn)

Most of Bt corn showed field unexpected damage after 3 years of launching in LATAM, imposing growers to readopt old pest control practices

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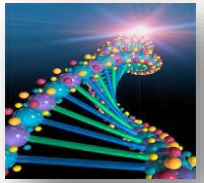
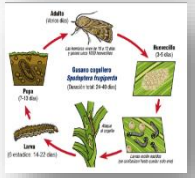
Insect Resistance Evolution to Bt Crops

Insect Resistance Evolution is driven by genetic contribution, pest biology/ecology and resistance management practices adopted



» Genetic structure of the population
» Number of genes
» Initial frequency of resistance alleles
» Genetic complexity
» Dominance of resistance
» Inheritance of resistance
» Number of genes

Genetic Contribution



» Life cycle
» Reproduction
» Flight capacity
» Fitness cost
» Polyphagia
» Host plants
» Species distribution
» Natural mortality
» Larva movement
» Diapause
» Competition

Pest Biology/ Ecology

» Moderation (refuge use, low dose events, etc.)
» Saturation (High dose Bt trait, high dose insecticide, etc.)
» Multiple attack (Two or more MoA or tactics of control)

Resistance Management

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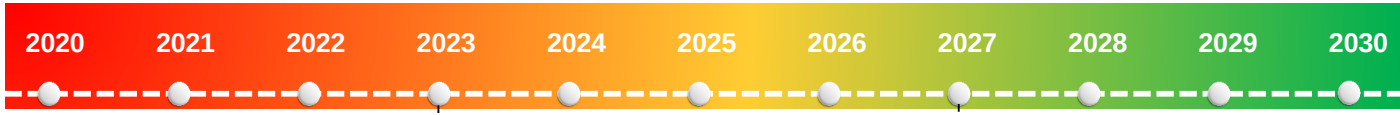
Impact of Strategies on Resistance Evolution to Bt Crops

There is no single miracle tool to extend Bt crops durability. Successful IRM is driven by strategies combination



IRM Strategies	Low Durability	Intermediate Durability	High Durability
Refuge Adoption	<25%	30-50%	>70%
Refuge Management	Poor	Adequate	Adequate
Good Practices Adoption	Low	Moderate	High

*Projections elaborated by IRAC-BR technical team.

IRAC

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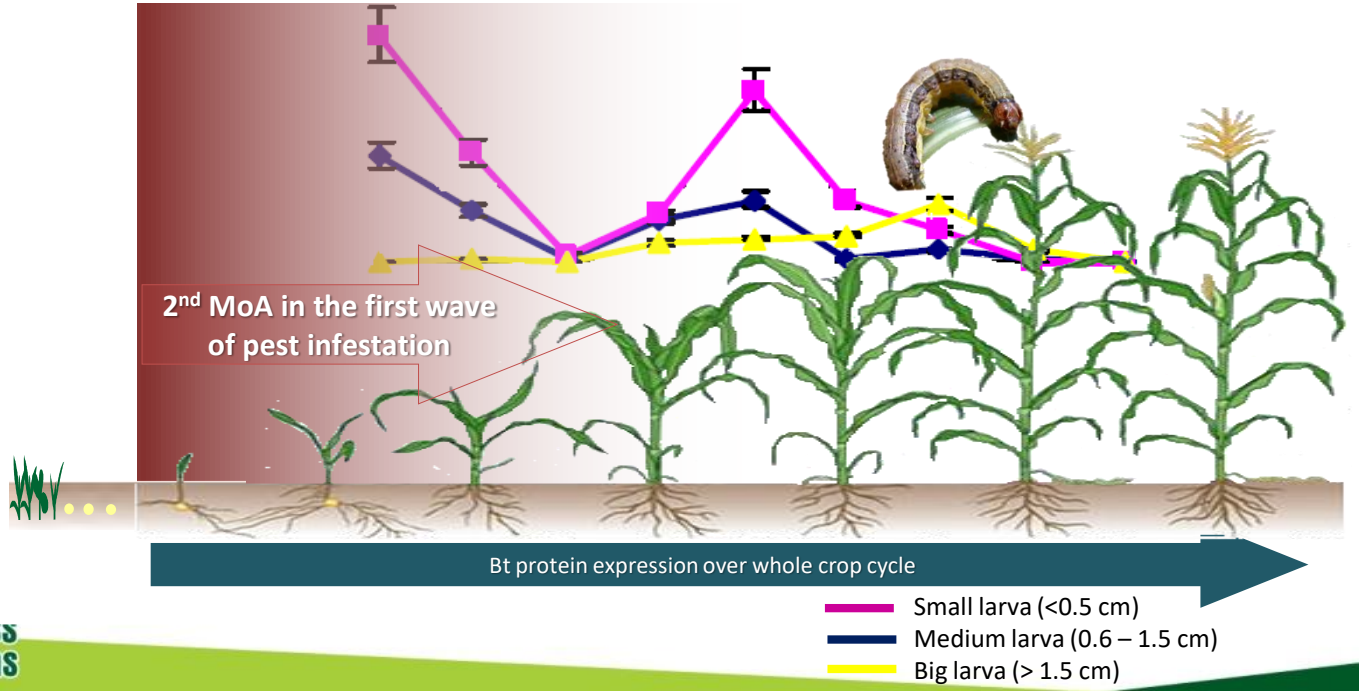
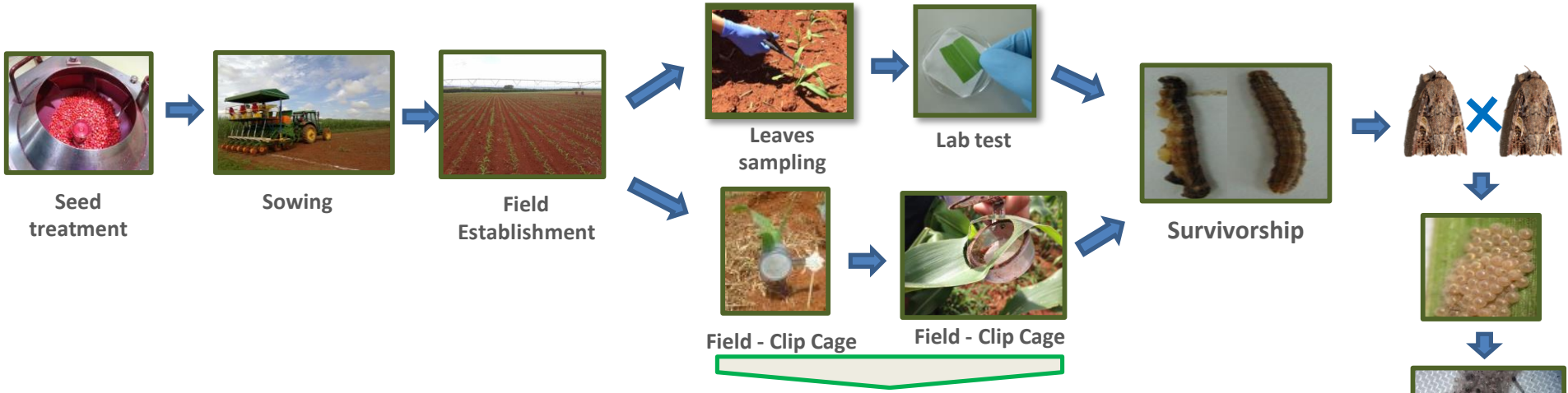
Seed Treatment as Additional IRM Strategy

Most critical FAW selection pressure occur at first pest migration (early corn crop stage). Effective 2nd MoA at this stage suppress FAW selection pressure



Effect of Cyantraniliprole in FAW

CYNT corn seed treatment: impact on FAW larva survivorship, F0 adults generation, eggs viability and F1 offspring generation



Treatments (FAW infestationTime)

CYNT Treated and Untreated

- ✓ 7 days after corn emergence
- ✓ 14 days after corn emergence
- ✓ 21 days after corn emergence

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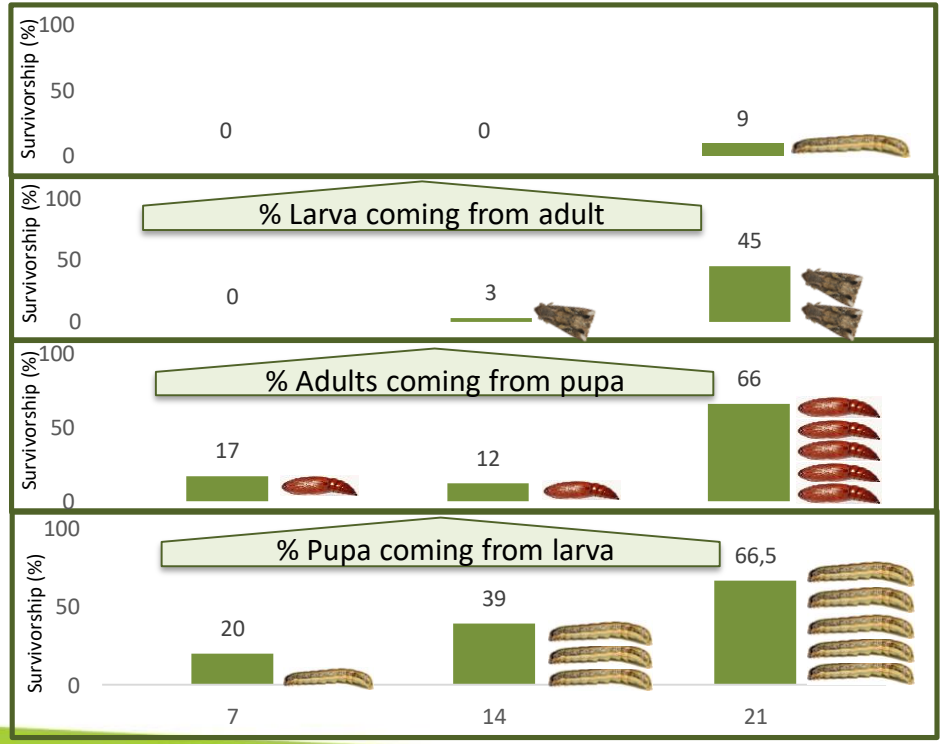
Effect of Cyantraniliprole in FAW

CYNT impact larva mortality, adults generation and F1 offspring even when neonate start feeding CYNT corn treated at 21 days after crop emergence

FAW larva survivorship, adults generation and F1 offspring generation after neonates exposed to CYNT at 7, 14, 21 days after corn emergence



Adults deformation

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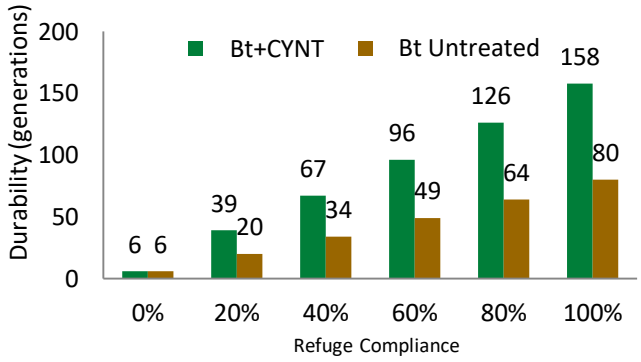
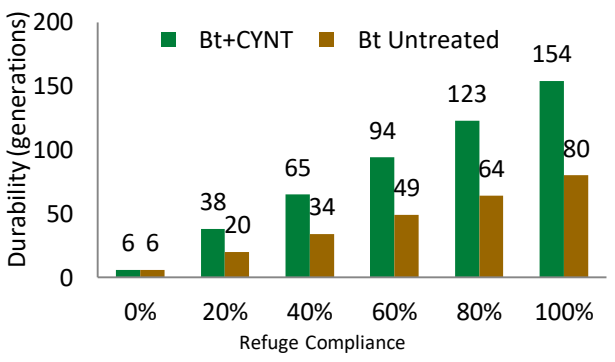
Impact of CYNT on Bt Trait Durability

Mathematic Modeling shows CYNT increasing Bt trait durability against FAW in a range of refuge compliance

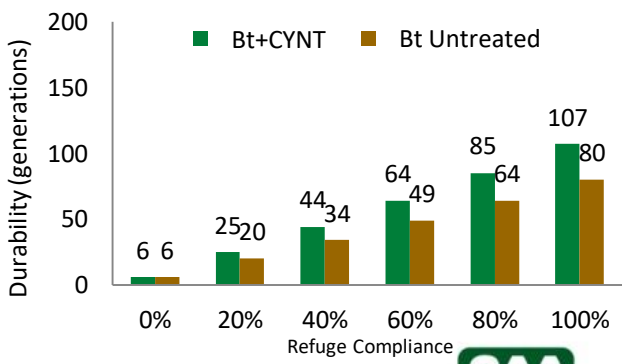
Bt durability if FAW migrate at **7 DAE** to corn field



Bt durability if FAW migrate at **14 DAE** to corn field



Bt durability if FAW migrate at **21 DAE** to corn field



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Final Remarks

- Adaptive potential of insects that reside in tropical environments limit Bt crops durability;
- “Green bridges” stablished by intense crop system in tropical zones contribute for high pest pressure year-round, challenging Bt crops as tactic of insect control;
- Refuge continue as the primary IRM strategy, but compliance is still a challenge;
- Seed Treatment is technically valuable IRM strategy contributing for extending Bt traits durability. Industrial Seed Treatment could ensure high compliance protecting Bt technologies in a regional manner;
- Strategies combination is the key of success. There is no single miracle tool to extend product durability.