

Insecticide Activity on the Cherry Fruit Fly in Cherry



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20th Century IPM

Industrial Age

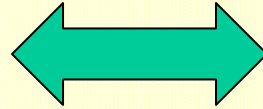
Limited information

Inexpensive, easy to use tools

Homogeneous broad spectrum
contact poisons

Limited regulatory restrictions

Multiple avenues for highest
and lower quality products



21st Century IPM

Information Age

Robust information

Expensive knowledge-based
tools

Selective and varied
performance characteristics

Greater regulatory restrictions

Very high quality standards

Conventional Insecticide Classes

Organophosphates

Guthion

Imidan

Malathion

Lorsban

Carbamates

Lannate

Sevin

Synthetic Pyrethroids

Asana

Warrior

Baythroid

Ambush/Pounce

Chlorinated Hydrocarbons

Thiodan

New Insecticide Classes

Particle Film

Surround

Spinosyns

Success/Entrust

GF-120, Delegate

Anthranilic Diamides

Altacor, Belt

Neonicotinoids

Provado, Actara, Assail

Insect Growth Regulators

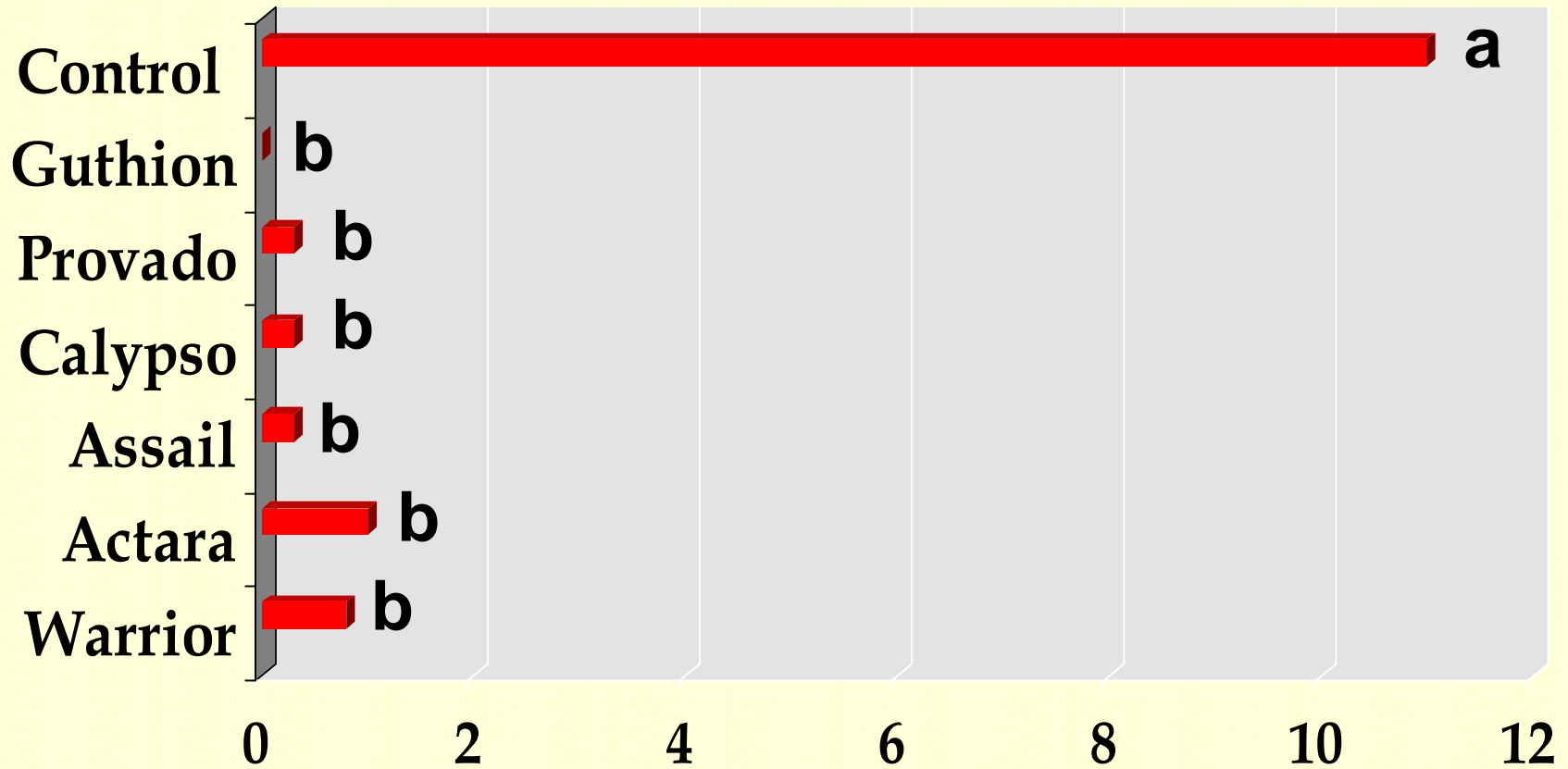
Intrepid, Esteem

Rimon

Oxidiazines

Avaunt

CONTROL OF CHERRY FRUIT FLY

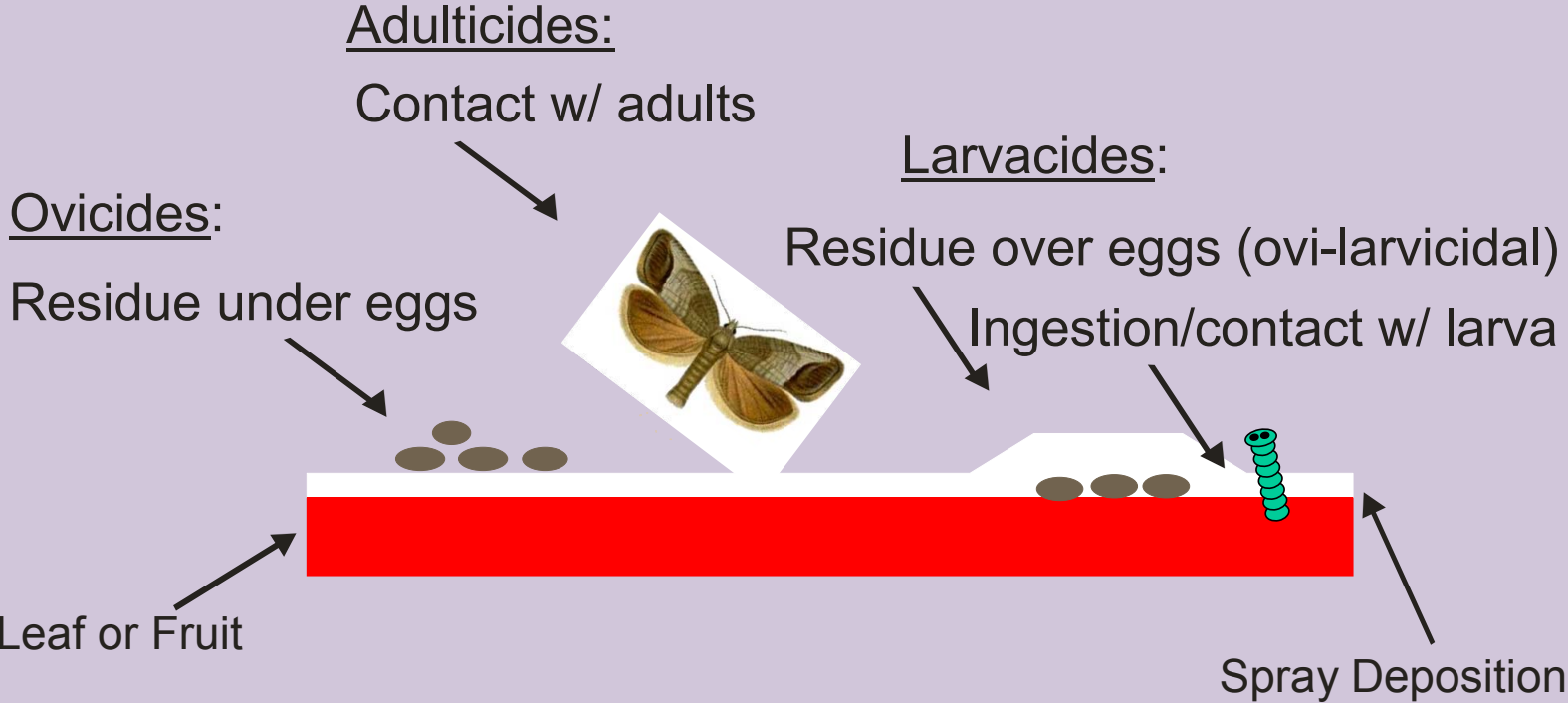


Ave. # larvae per 100 fruit, NWHRs, Aug 2003 (P= .05, LSD)

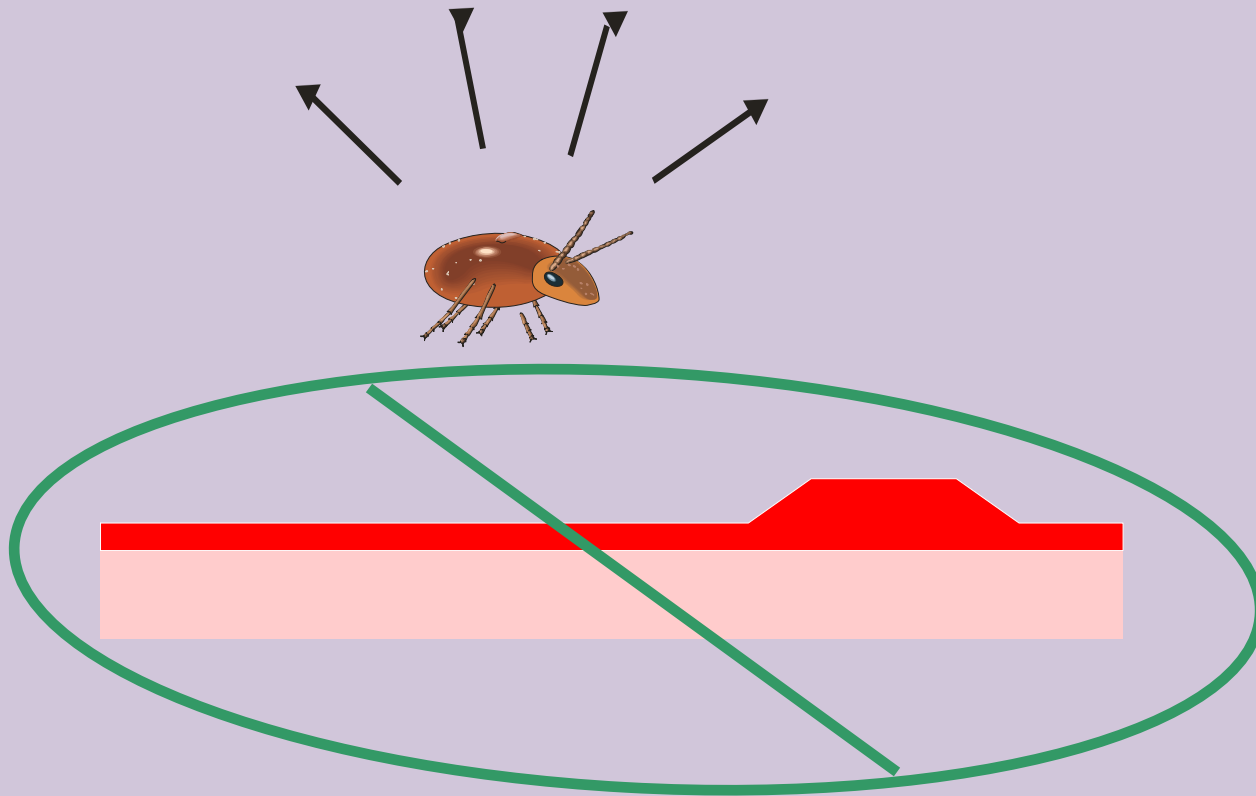
Conventional Insecticides

- OP and Carbamate compounds
 - Acetylcholinesterase Inhibitors
 - Nerve poisons acting on the synapse, causing acute death.
- Synthetic Pyrethroid compounds
 - Sodium Channel Agonists, causing repeated firing and death.

Lethal activity results in direct mortality of the pest



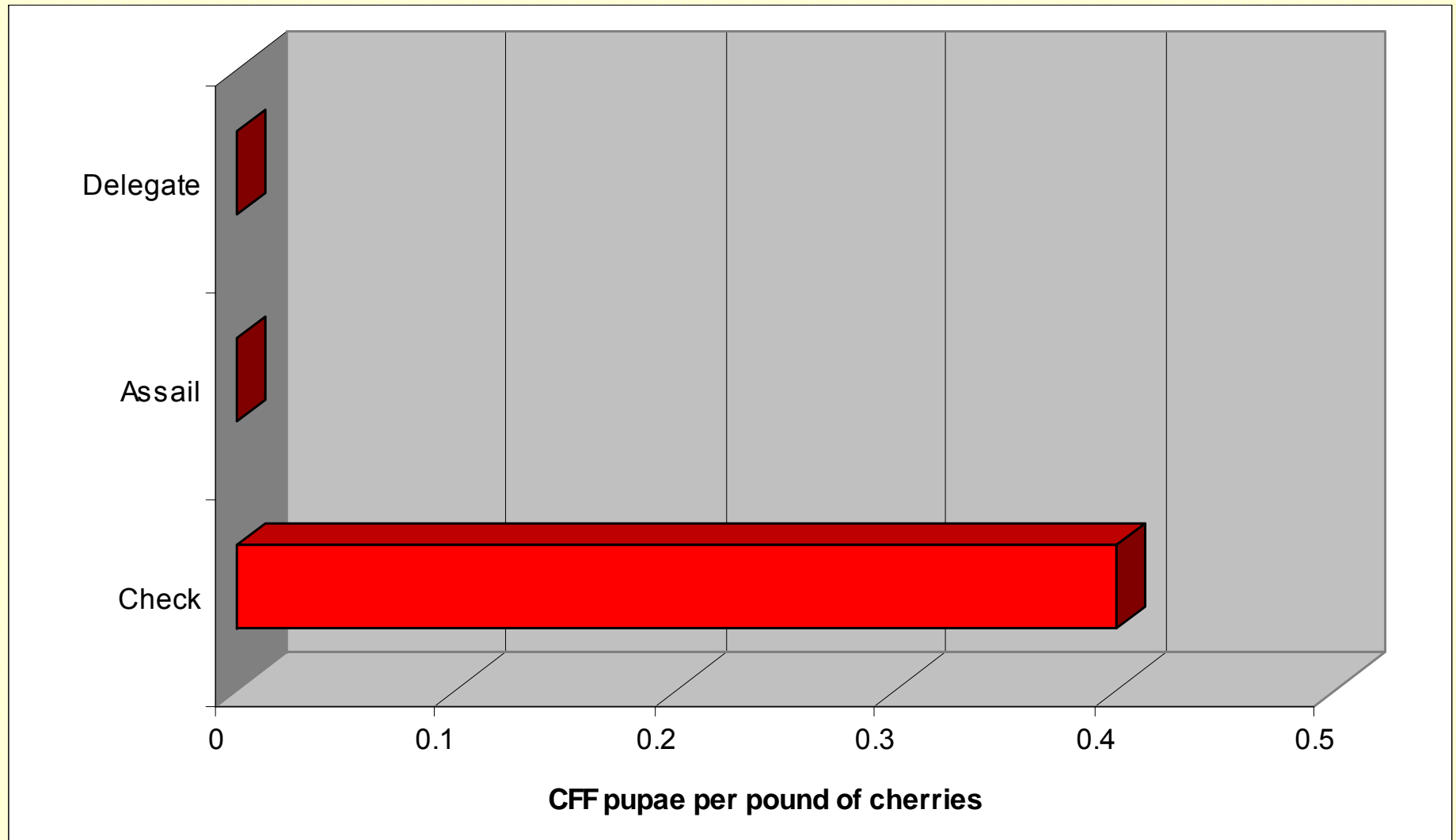
Repellents cause the pest to actively avoid the treated substrate



Spinosyns

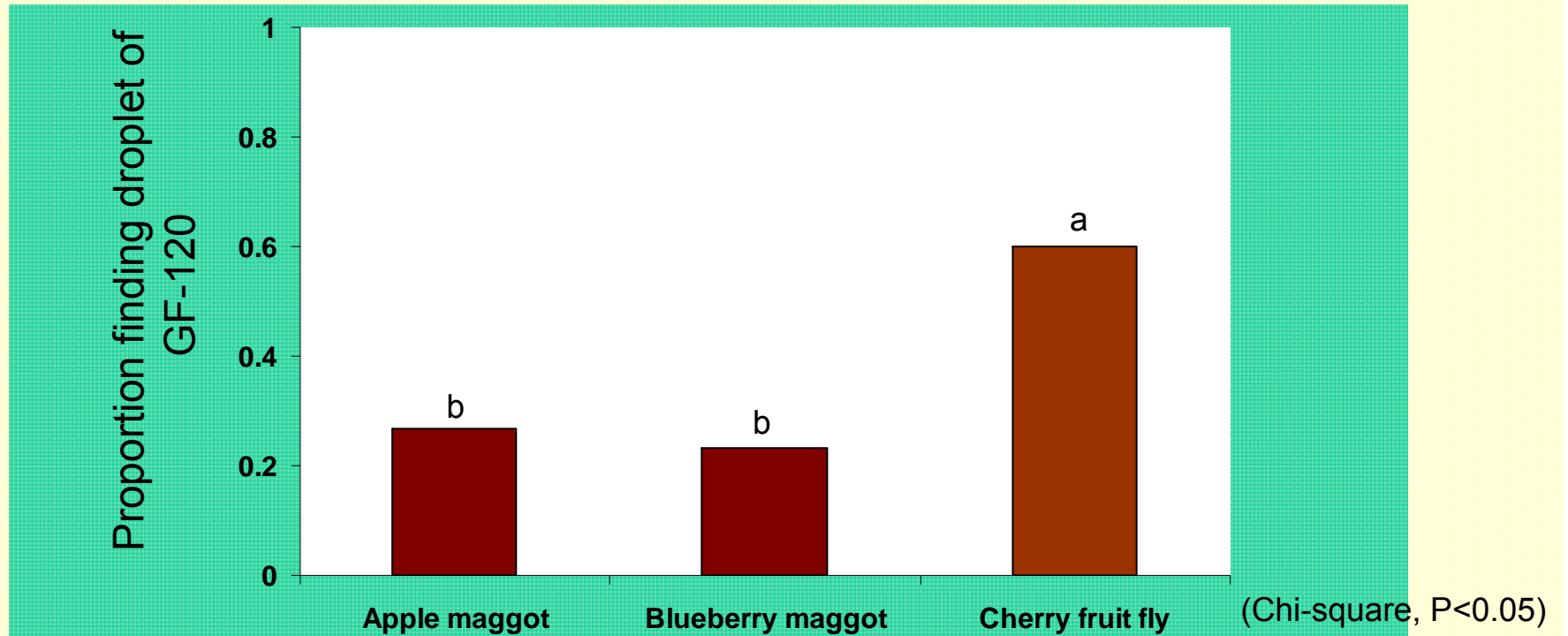
- *Saccharopolyspora spinosa* (Success, Entrust, Delegate)
 - Derived from an actinomycete bacterium through a fermentation process.
- Spinosyns activate the nicotinic receptors in the insect nerve cell.
- Have some contact efficacy, but much more active when ingested.
- Short residual activity

Control of Cherry Fruit Fly in Sweet Cherries

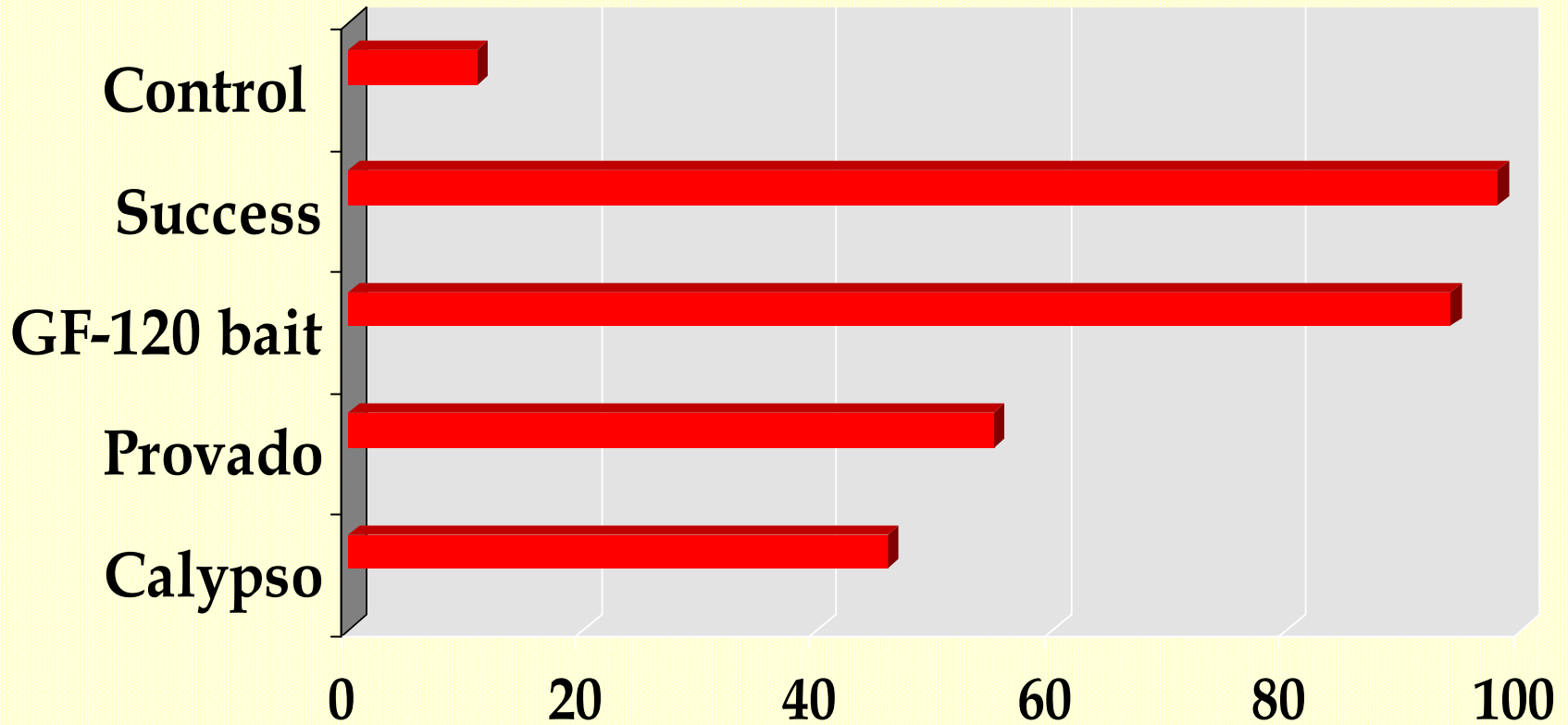


Response to GF-120 Bait (Tiexeira et al, PMS, 2008)

Species-dependent



Mortality of Cherry Fruit Fly Adults

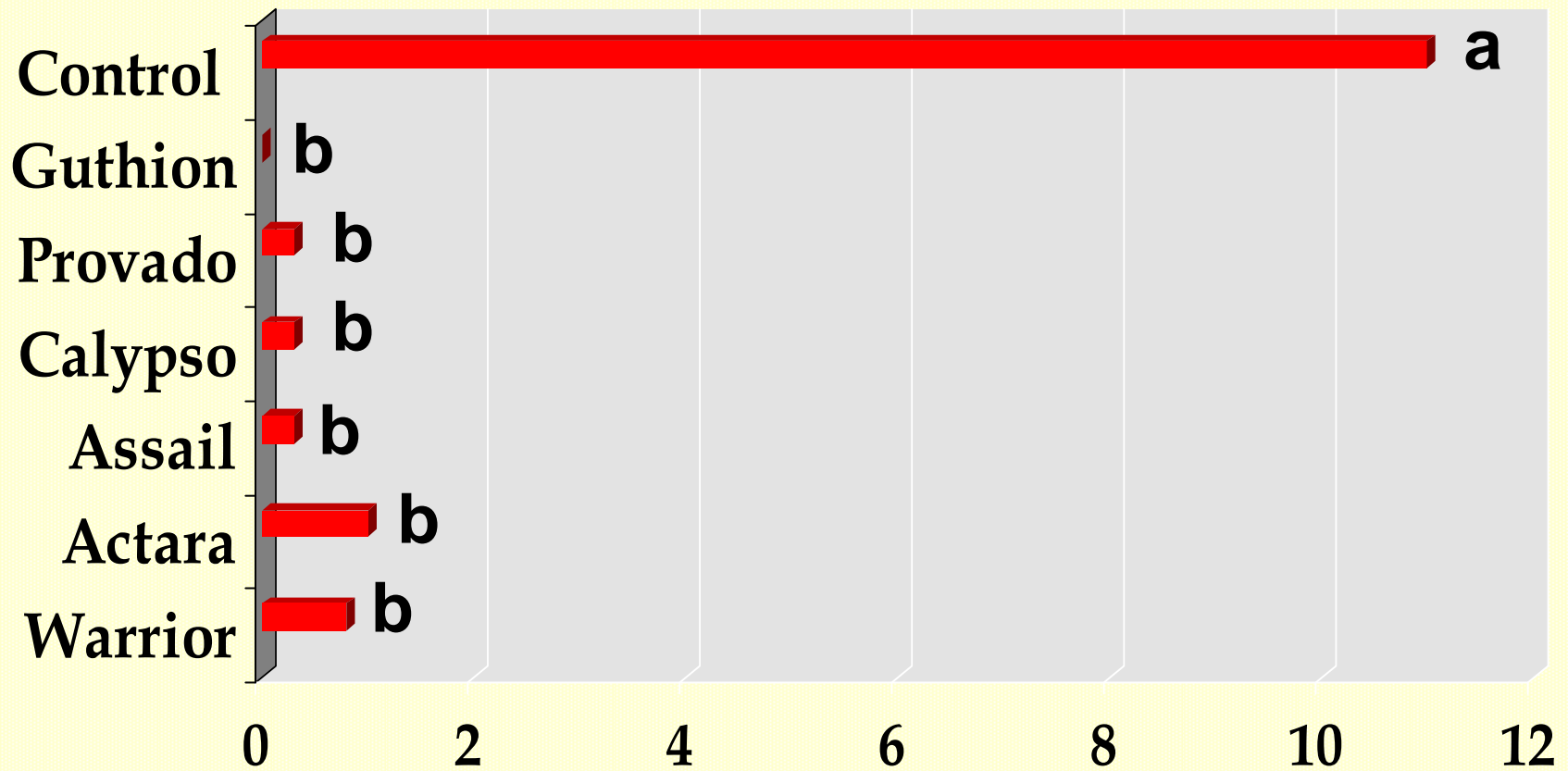


(Yee and Alston. 2006. JEE, vol 99, no. 5)

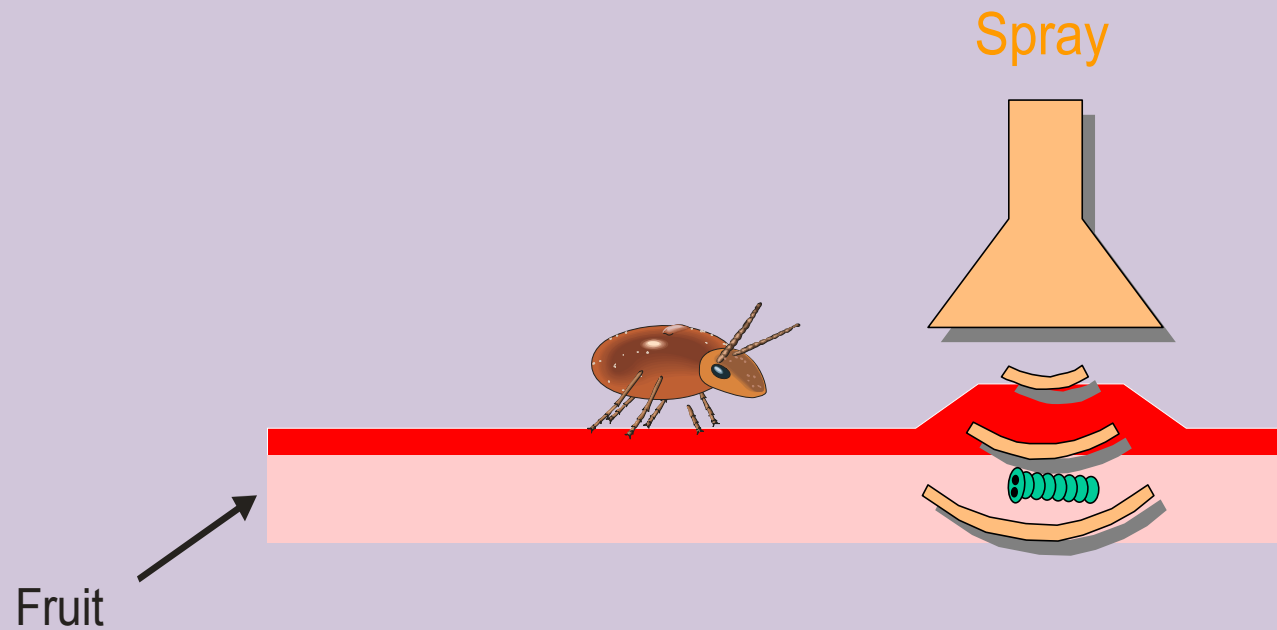
Neonicotinoids

- Neonicotinoid compounds
 - Provado, Actara, Assail, Calypso, Clutch
- Nicotinic agonists
 - Activate Nicotinic ACh receptors in the insect nerve cells, preventing normal ion flow.
 - Systemic qualities provide long term activity.
- Lethal and curative effects, anti-feedant and oviposition deterrence.

CONTROL OF CHERRY FRUIT FLY



Curative activity is lethal action on a pest post-infestation resulting from the transitory penetration of the insecticide into plant tissue.

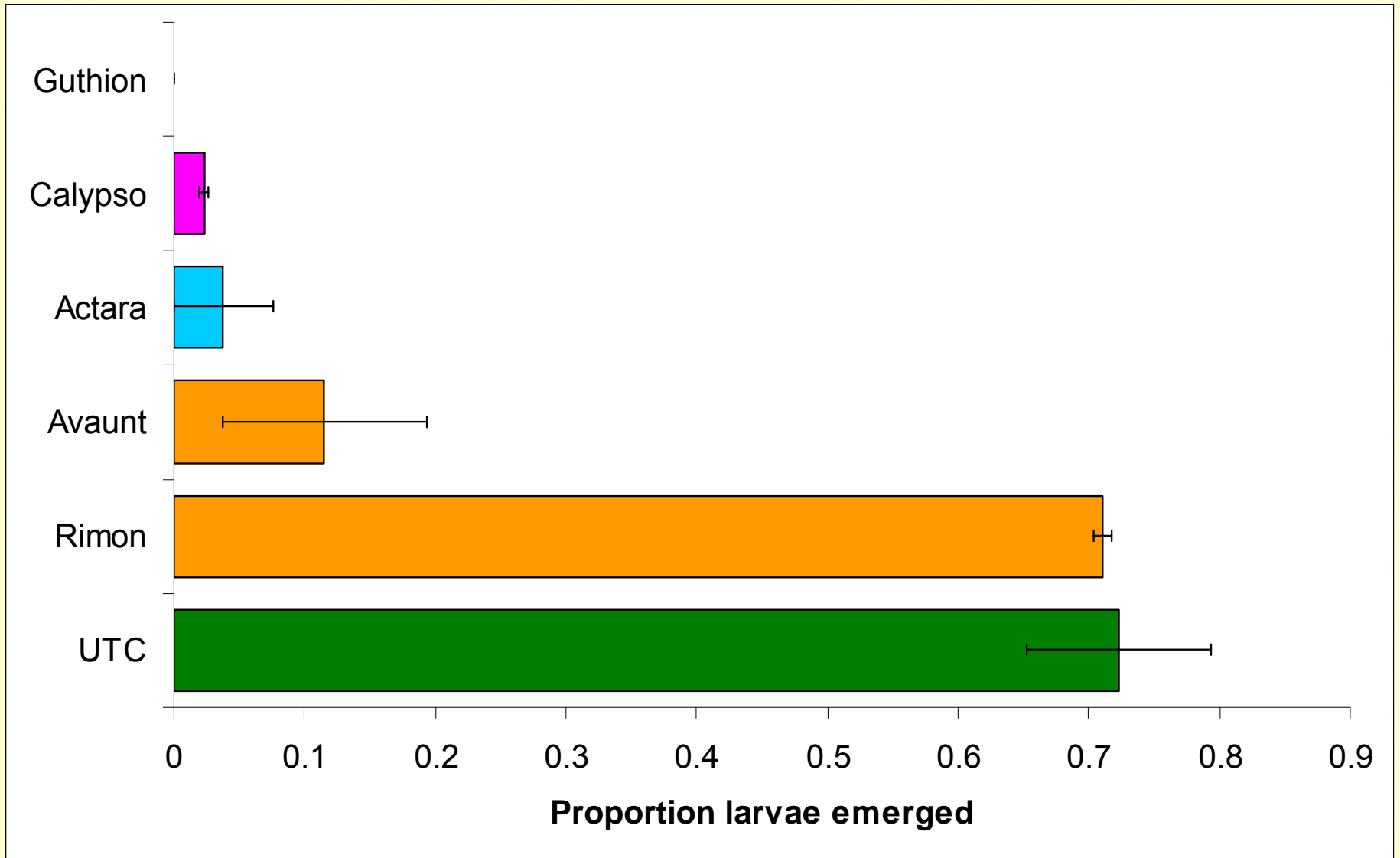


Curative Activity Bioassays

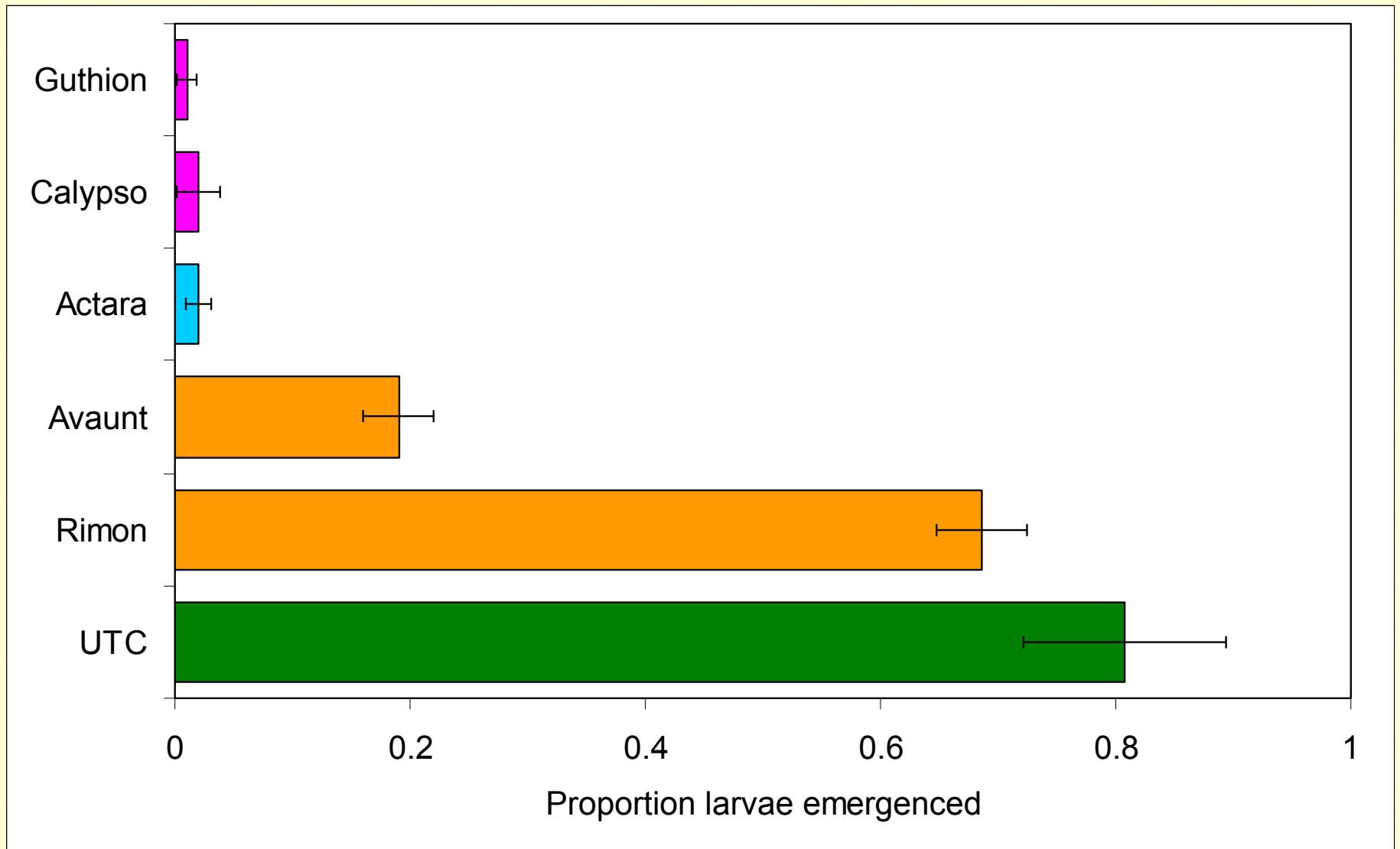
- Bioassay methods:
 - Bag limbs of fruit in the field
 - Expose fruit clusters to insect egg laying.
 - Collect fruit after oviposition.
 - Spray fruit with treatment compounds in the lab.
 - Measure larval emergence.



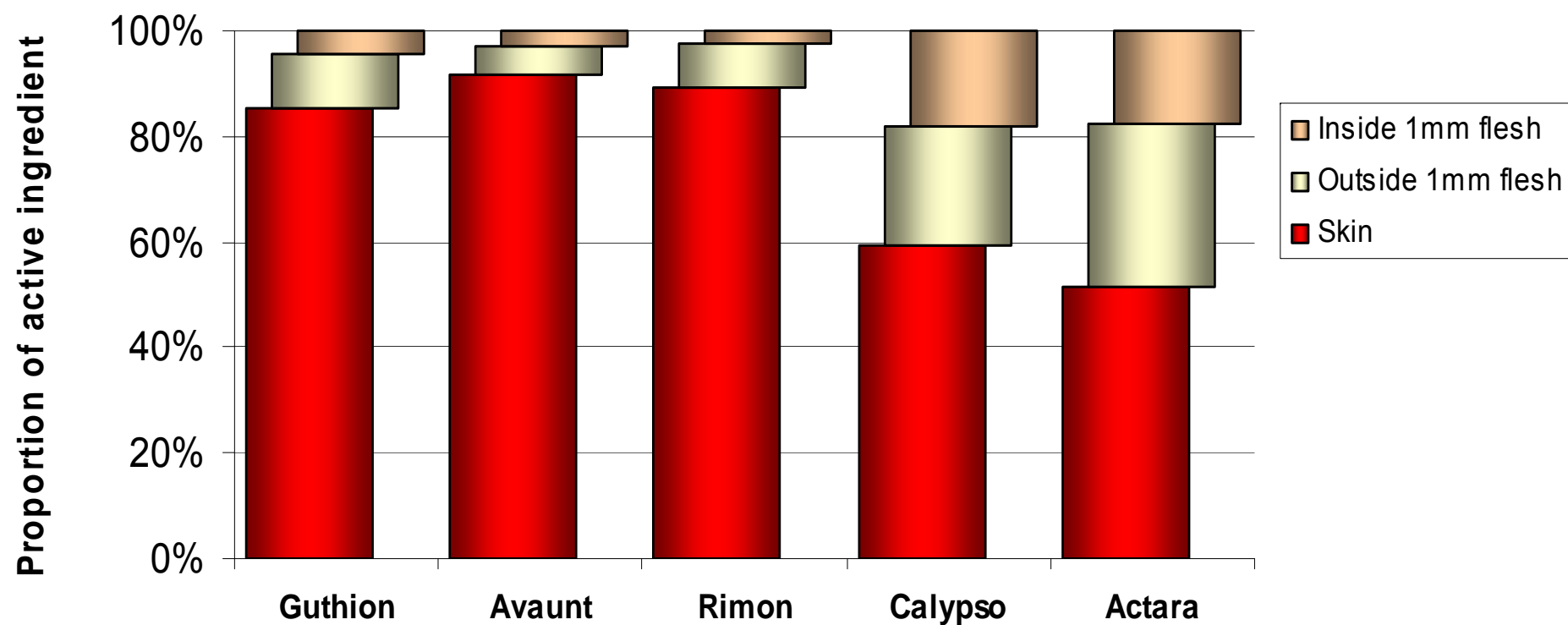
Curative Activity Targeting Small PC Larvae



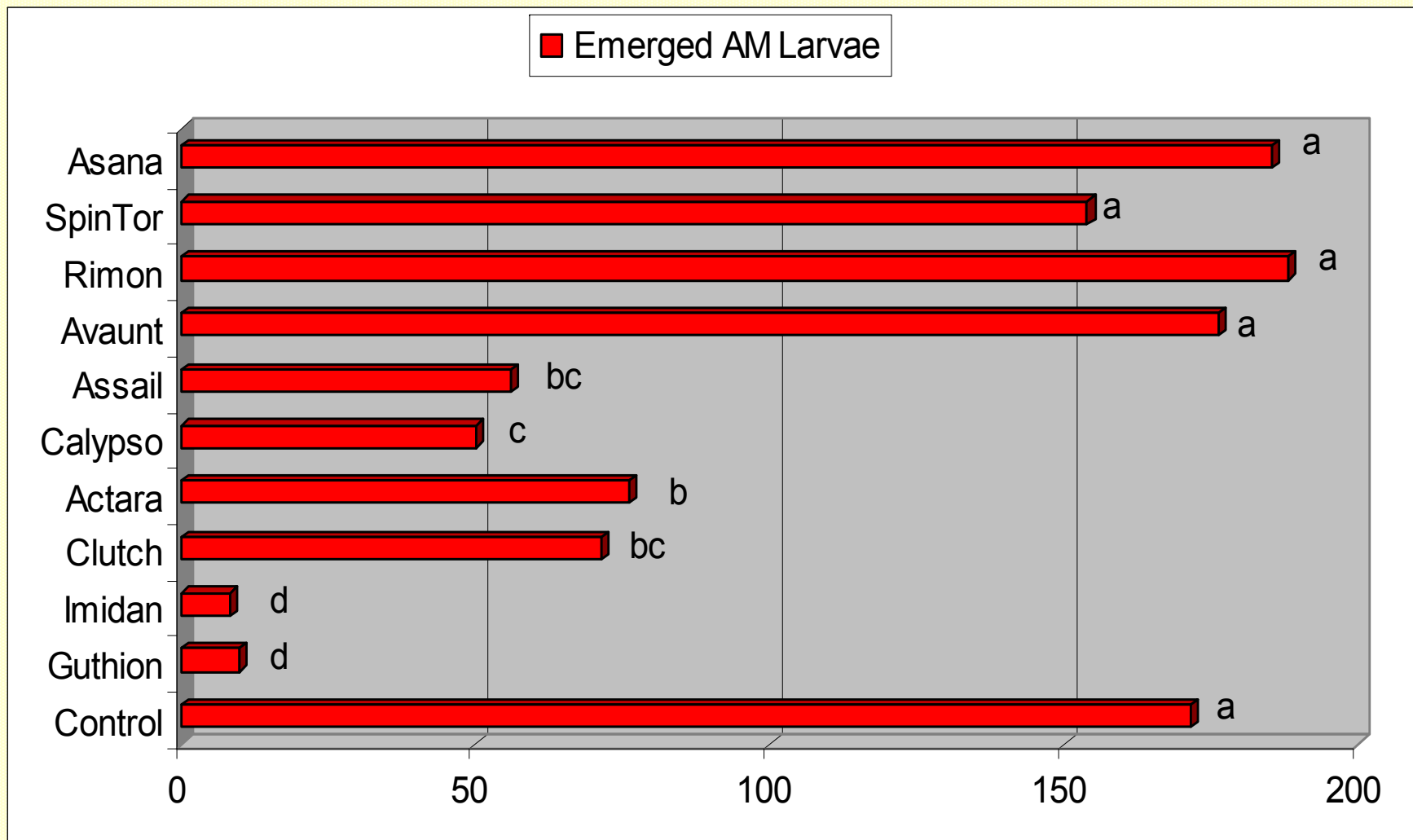
Curative Activity Targeting Large PC Larvae



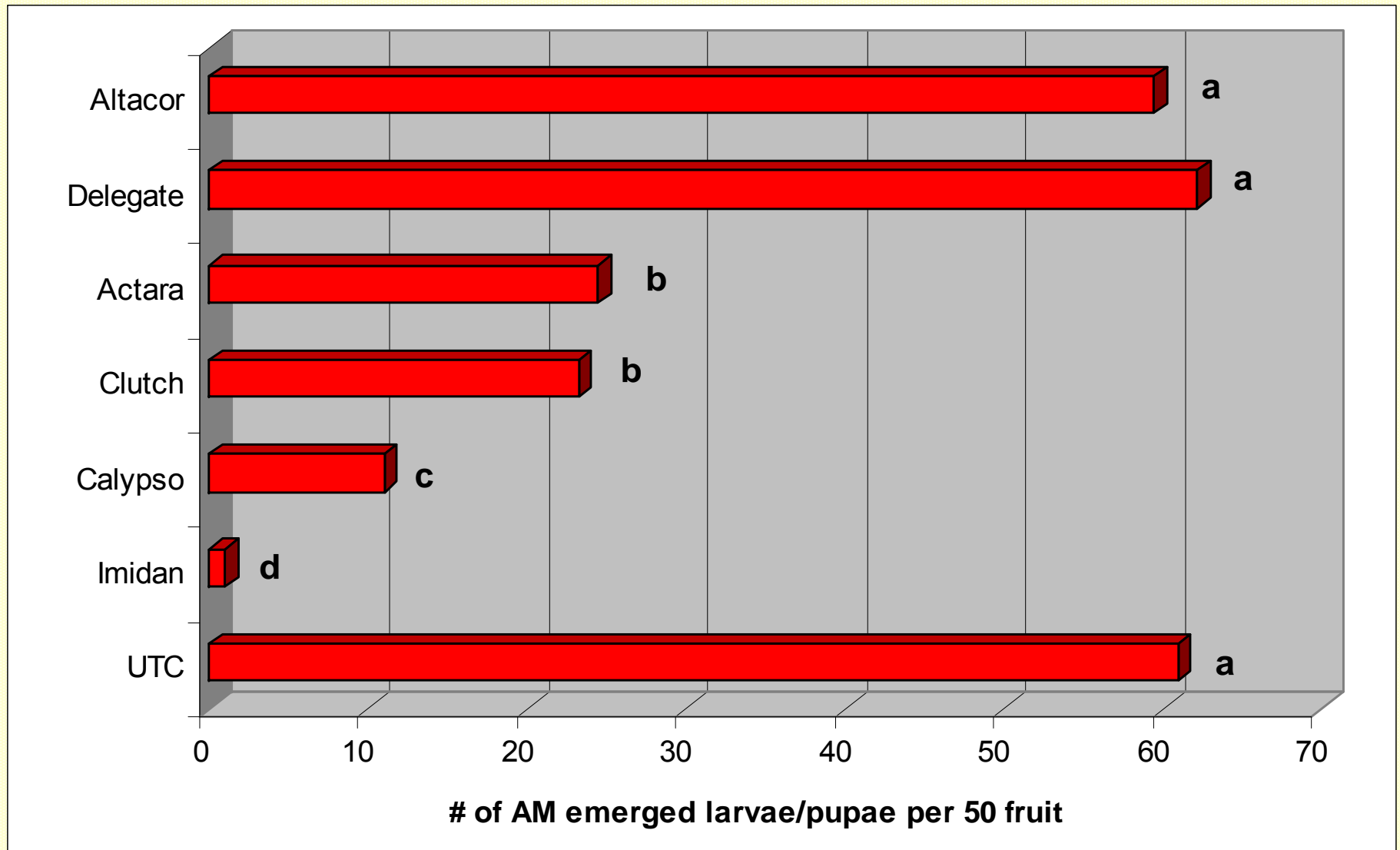
Insecticide Penetration into Cherry Fruit

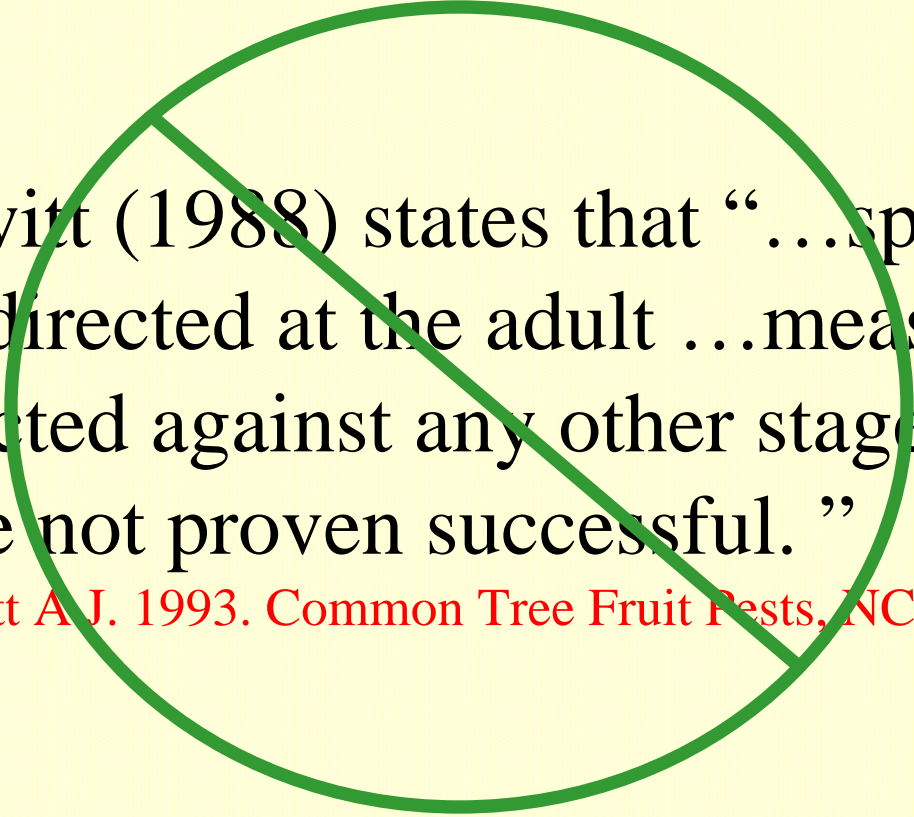


Curative Activity of Insecticides on Apple Maggot



Curative Activity of Insecticides on Apple Maggot





Howitt (1988) states that “...sprays are directed at the adult ...measures directed against any other stages have not proven successful.”

(Howitt A.J. 1993. Common Tree Fruit Pests, NCR 63)

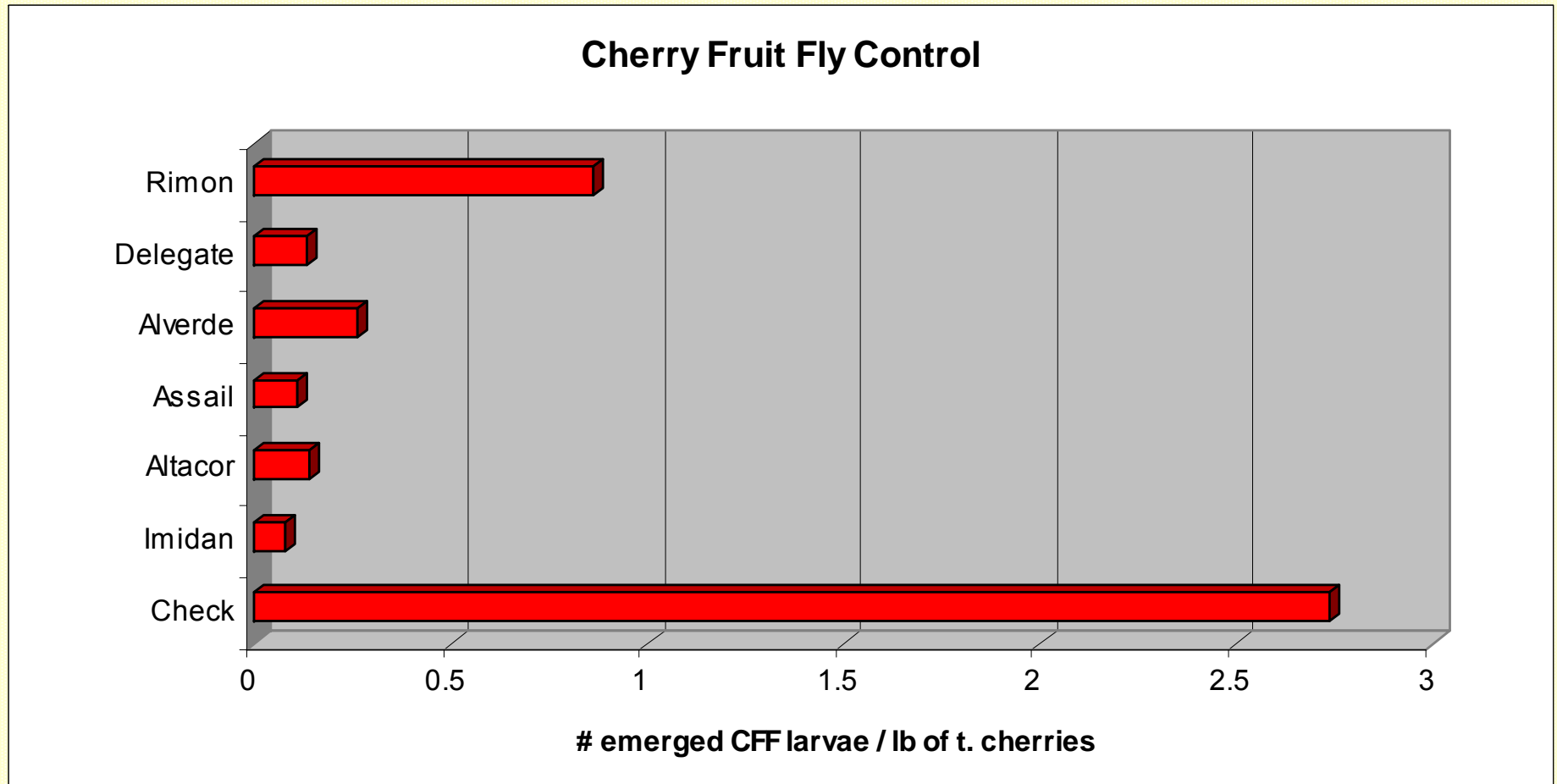
Yee and Alston (2006) state that “...eggs and larvae inside the cherries were probably killed by the insecticides, because few or no larvae emerged from the treated cherries.”

(Yee and Alston. 2006. JEE, vol 99, no. 5)

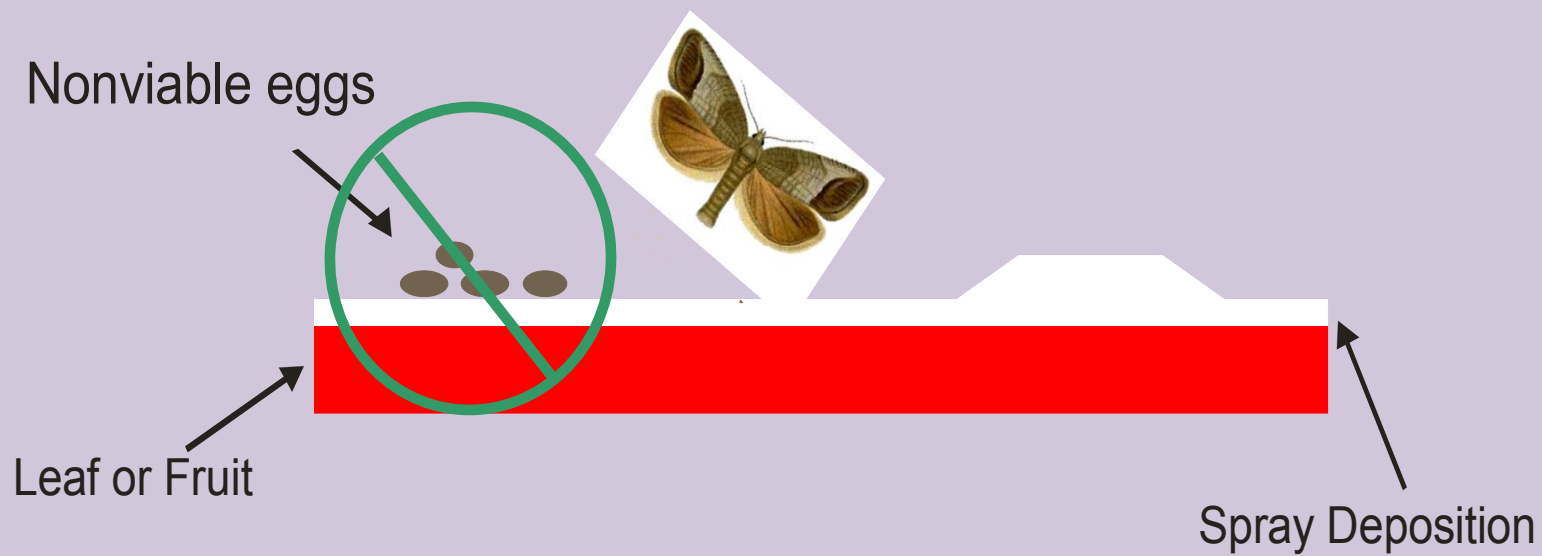
Insect Growth Regulators

- Molt Accelerating Compounds (Intrepid)
 - Mimic the natural insect hormone ecdysone
 - Induces in larvae a premature molt
- Juvenile Hormone Mimics (Esteem)
 - Inhibits metamorphosis and adult emergence
 - Suppresses embryogenesis in eggs
- Chitin Synthesis Inhibitor (Rimon)
 - Prevents development of exoskeleton
 - Sublethal effects on some pests

Control of Cherry Fruit Fly in Tart Cherries

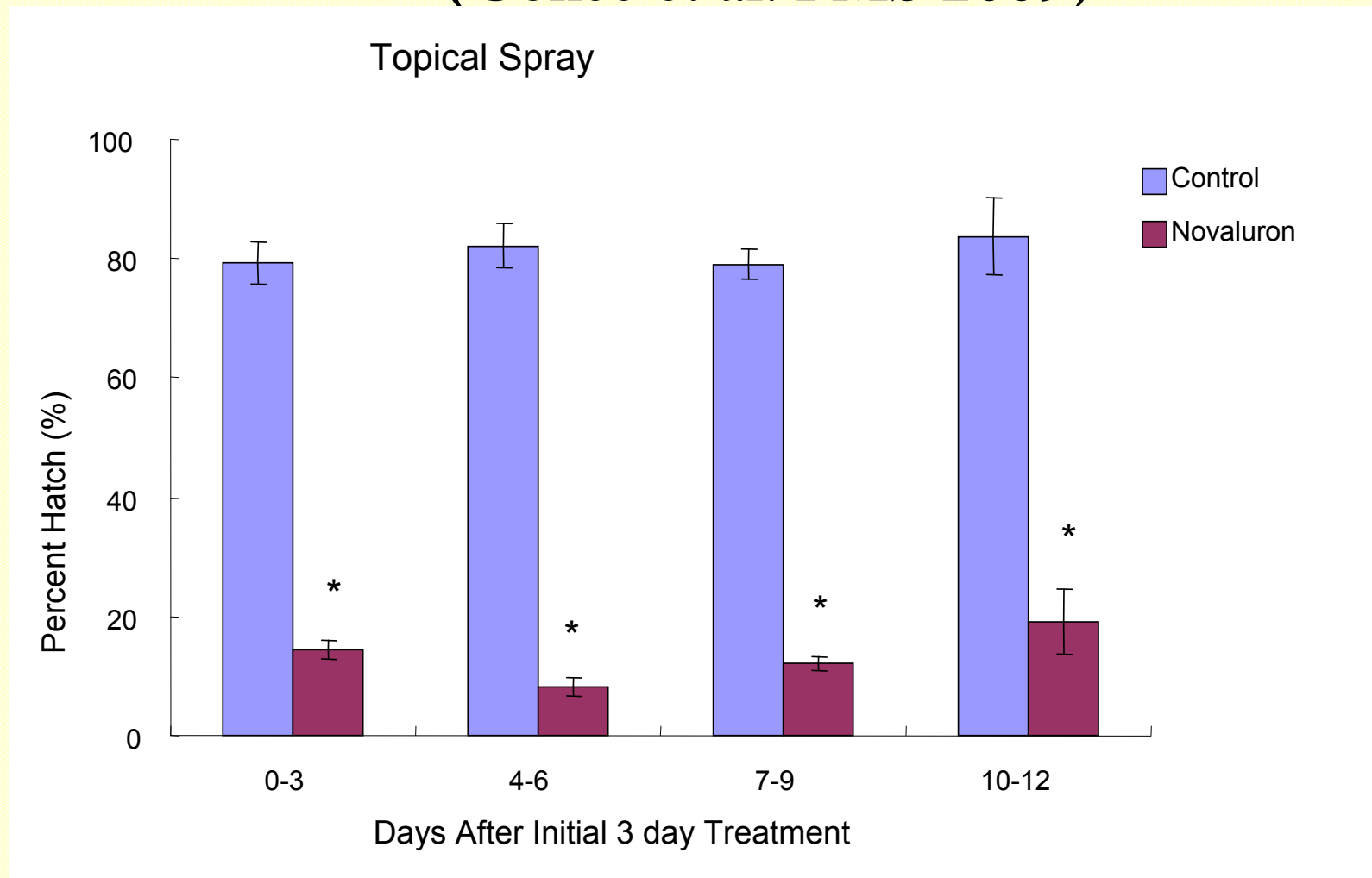


Sub-lethal activity affects the subsequent generation of the pest



Novaluron Sub-lethal Effects on Codling Moth

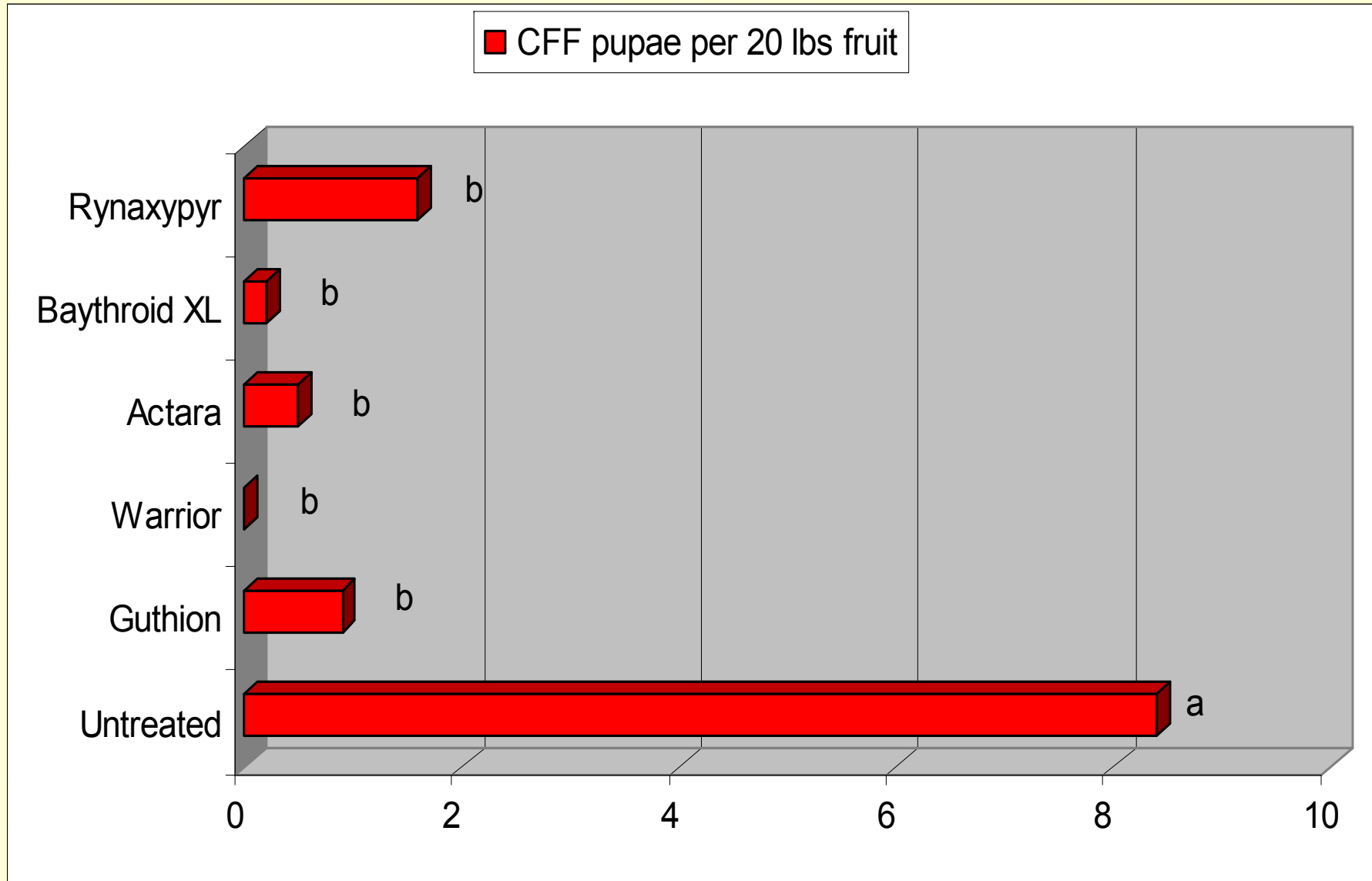
(Gökce et al. PMS 2009)



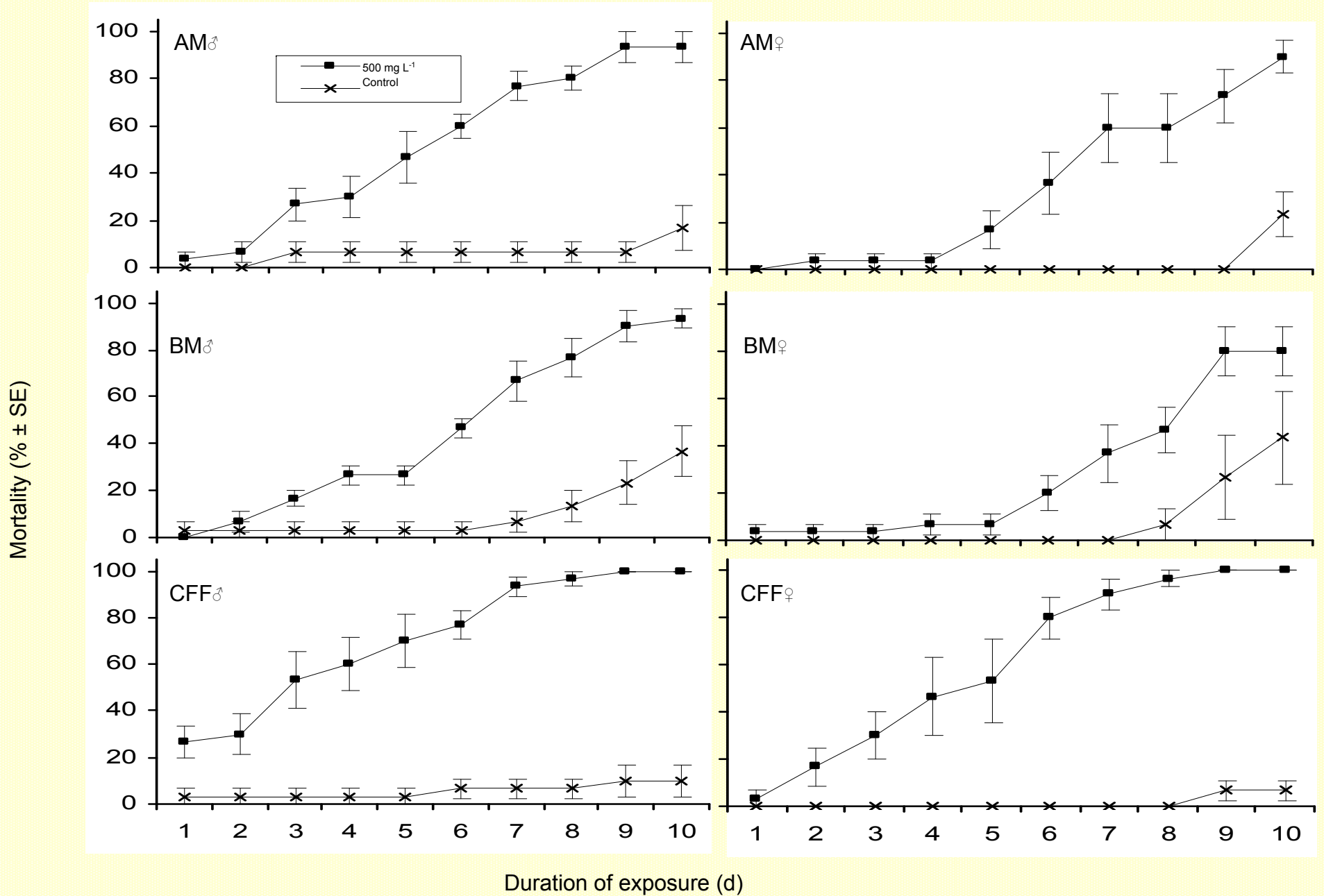
Anthranilic Diamides

- Diamide compounds
 - Altacor, Belt
 - Activate ryanodine receptors in the insect muscle, causing paralysis and death.
- Lethal to larvae and adults when ingested or in contact with the insect egg.

Control of Cherry Fruit Fly in Tart Cherries



Tarsal Contact Toxicity of Altacor Fruit Flies (Tiexeira et al, PMS, 2008)

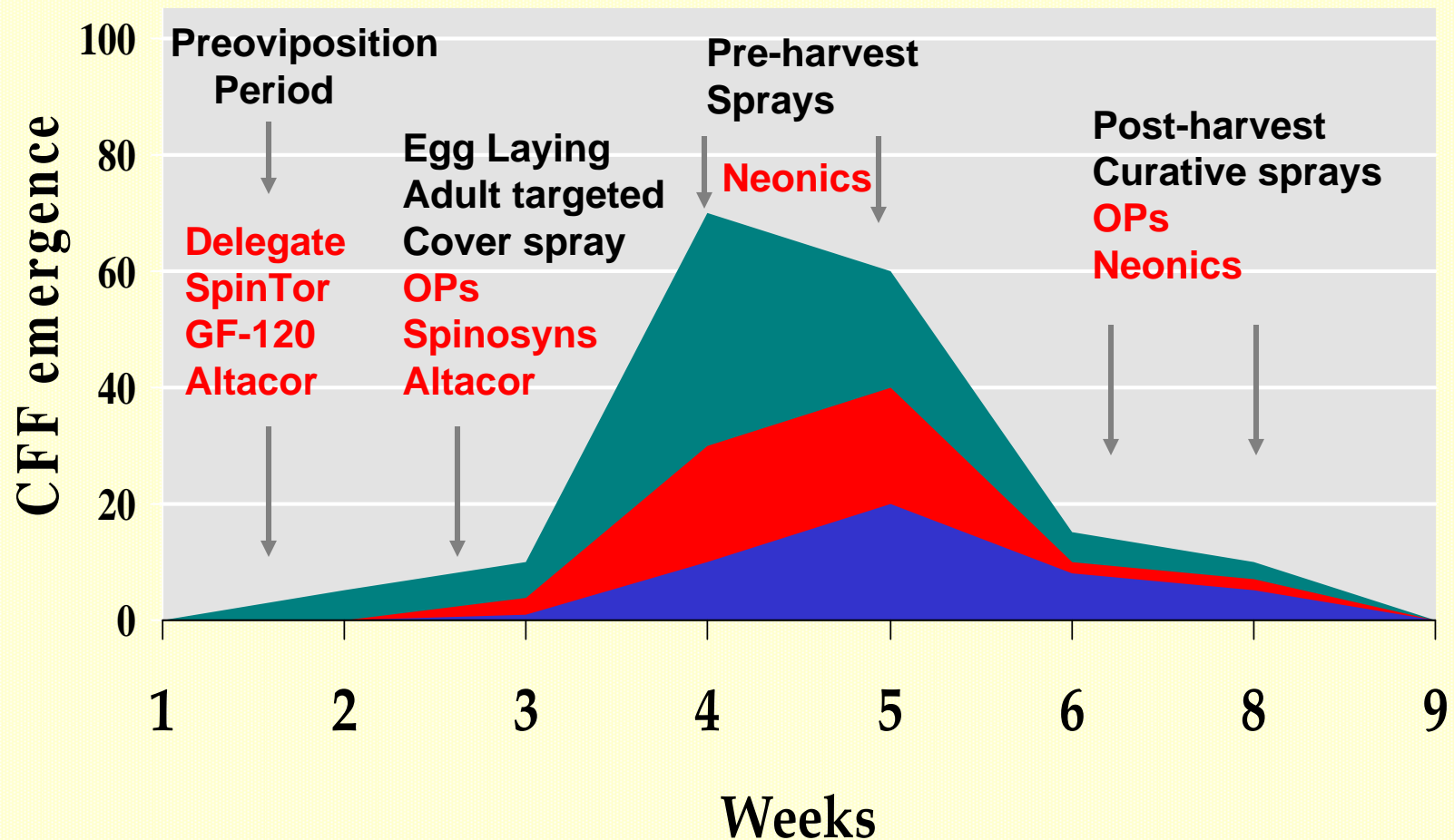


Insecticidal Activity on Cherry Fruit Fly

Compound	Adults	Larvae/Eggs
OPs	Lethal via Contact	Curative
Pyrethroids	Lethal via Contact	None
Spinosyns	Lethal via Ingestion	None
Anthranilic Diamides	Lethal via Ingestion	None
Neonicotinoids	Moderately Lethal via Ingestion	Curative
IGRs (Novaluron)	Sub-Lethal via adult contact (?)	Non-viable eggs

Optimal Timing for Cherry Fruit Fly Control

■ Adults ■ Eggs ■ Larvae



Implications for Pest Management

- Pest Management Decision-making should consider all life stages and optimal mode-of-exposure for the pest.
- A control action should maximize the impact of the selected tool.
 - Timing, coverage, residual, rate, secondary pests, impact on beneficials.