

Fumigation Update



Skadedydagene 2015

David K. Mueller, BCE

Insects Limited, Inc.

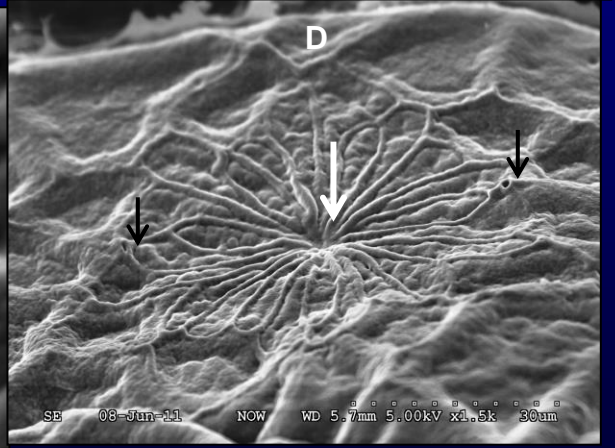
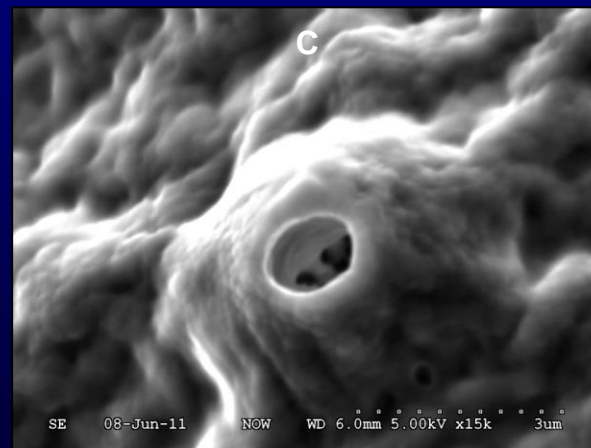
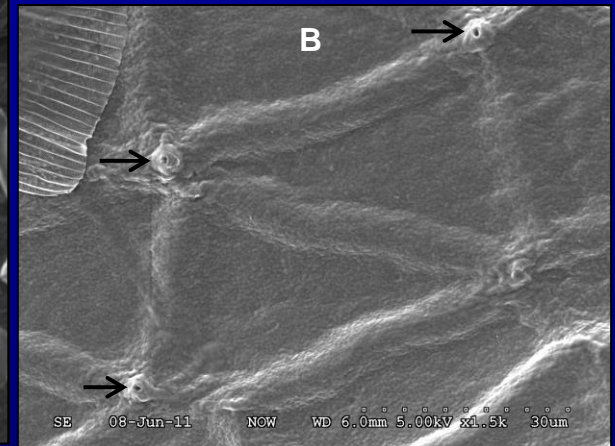
Knowing the pest is half the battle in controlling it.



Cold Blooded Insects vs. Warm Blooded Mammals

Fumigants and Eggs

Micropyles are openings on the surface of the egg wall through which male insect sperms enter the egg causing fertilization.



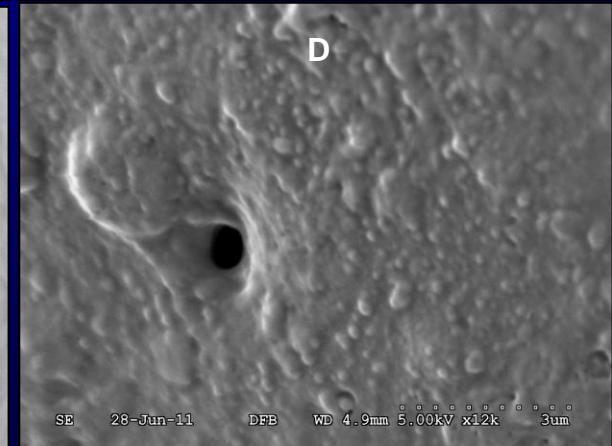
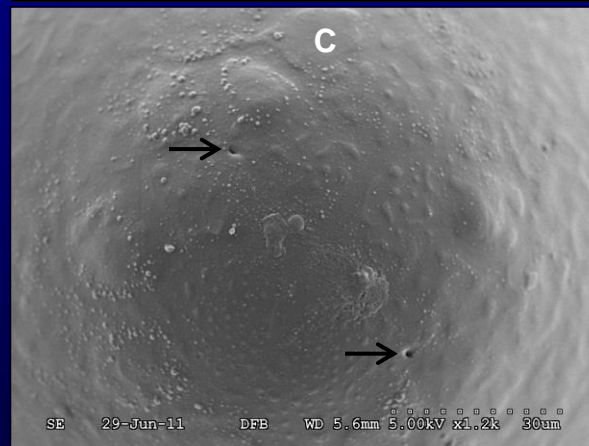
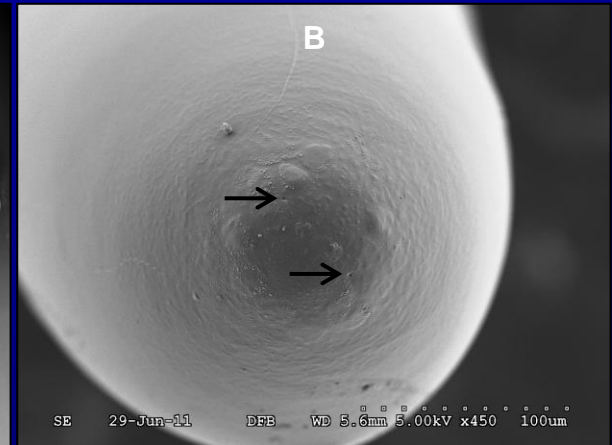
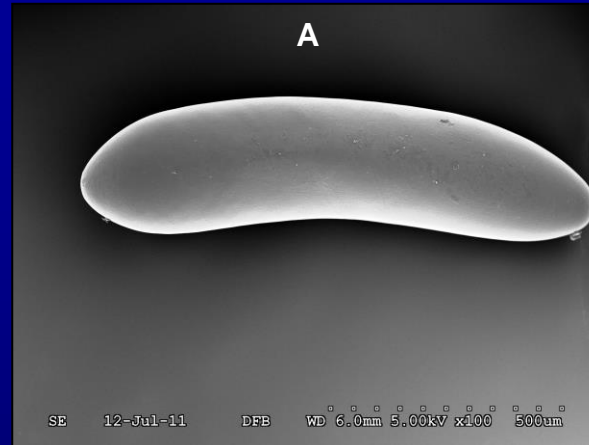
Moth eggs



Fumigants and Eggs

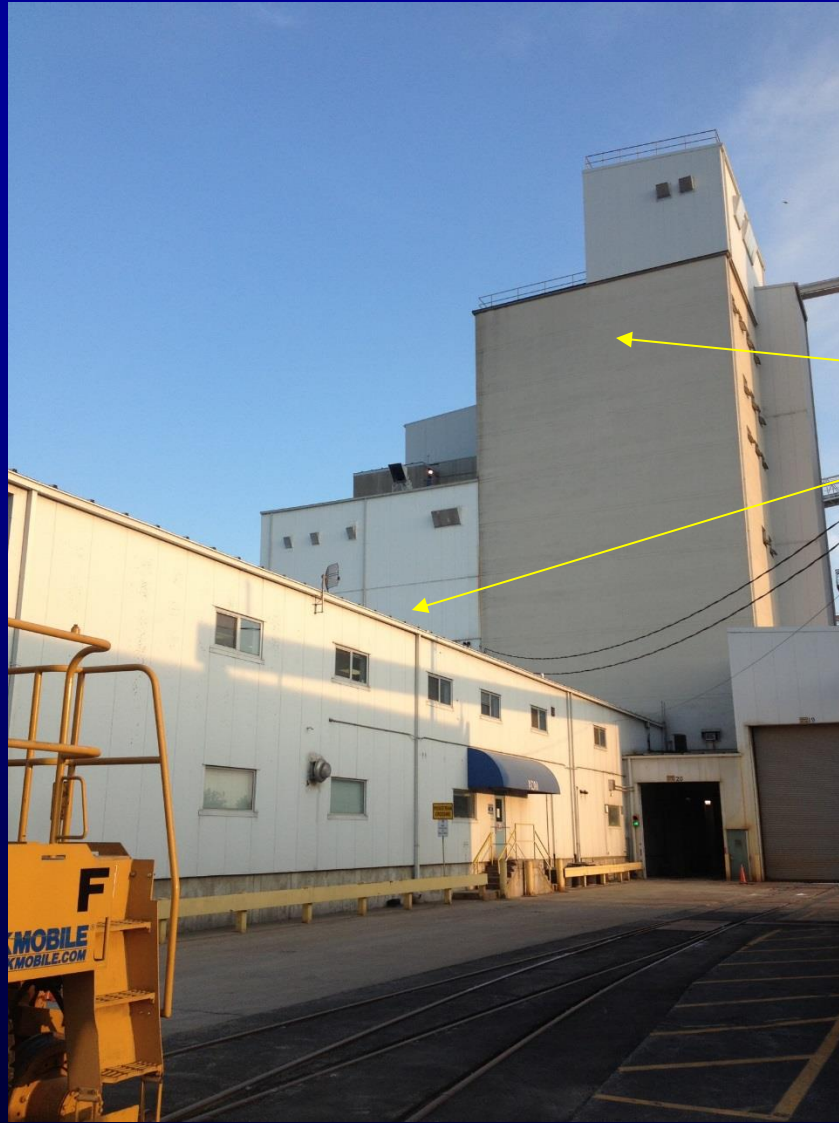
Aeropyles:

- Holes in the egg wall that allow gases to enter the egg.



Beetle eggs.





Flour Mill Fumigation

ProFume® (sulfuryl fluoride)

Six floor mill @ 35° C

Warehouse and offices @ 20° C

Twice as much ProFume
needed for warehouse/m3

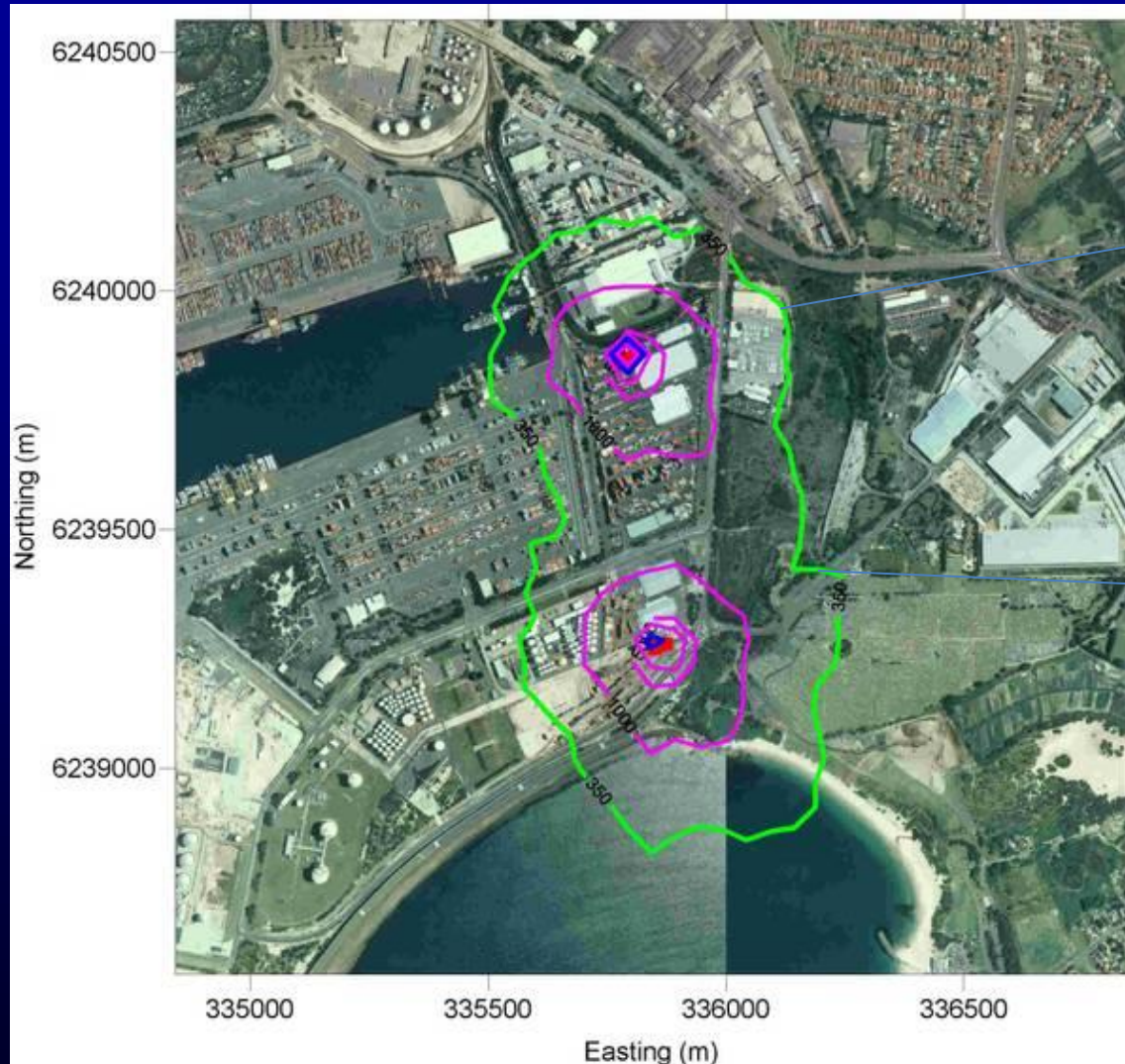


Fumigant Buffer Zones



What is a Buffer Zone ?

Port Botany Methyl Bromide Detection



Moderate
gas readings

Extreme
gas
readings

Fumigant Buffer Zones



Wellington, New Zealand

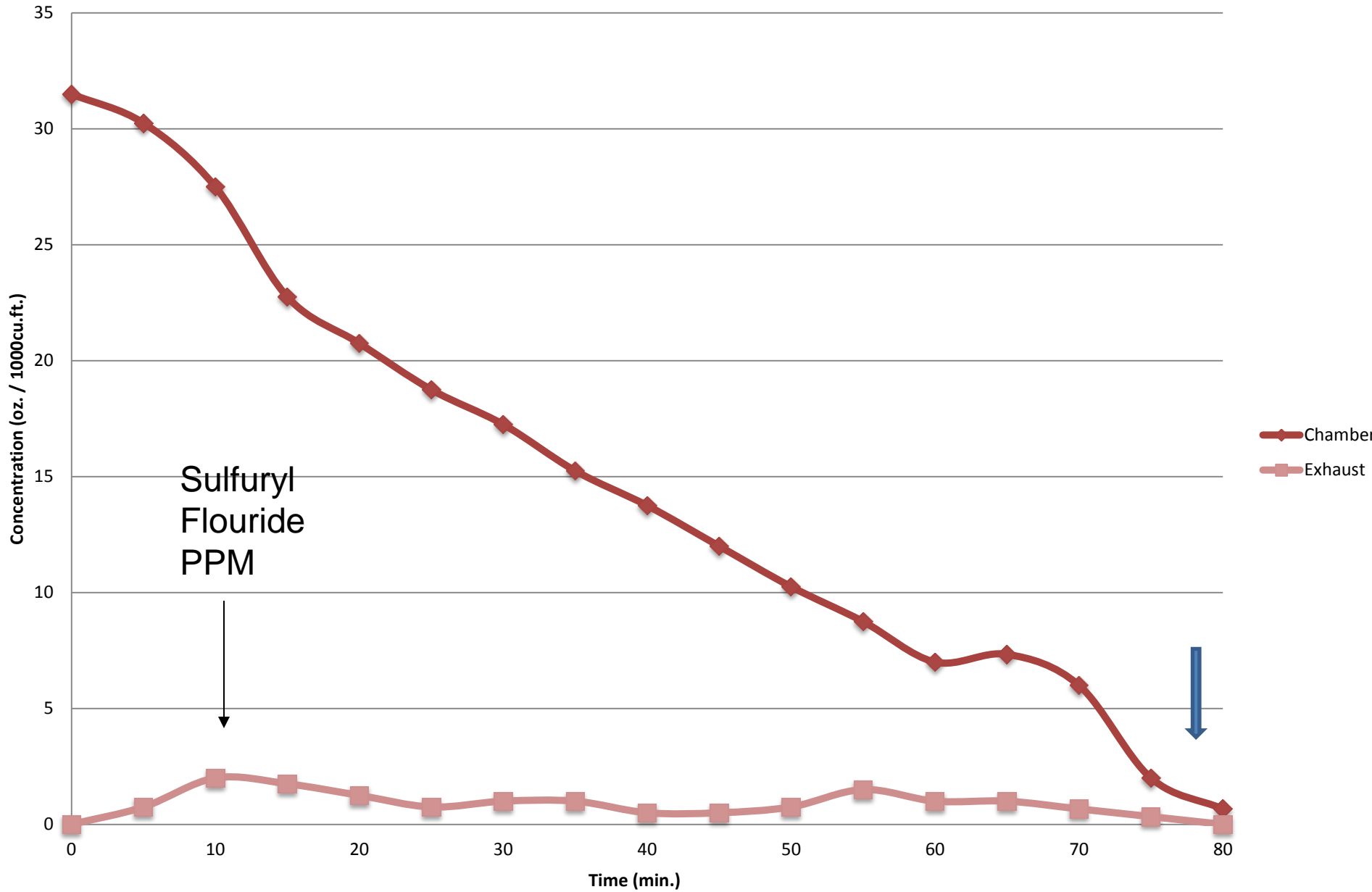


Scrubber Fumigants



Sulfuryl Fluoride Scrubbing

Research Fumigation Chamber (28m³) n=4



SCRUBBING EXPORT LOGS



- 70% retention of fumigant to be scrubbed

- USDA Export Log Fumigation Warehouses in Westfield, Indiana; Joliet, Illinois; and Heyworth, Illinois.



ISPM -15 Fumigations



NEW Labeling for Sulfuryl Fluoride

ProFume from Dow Agrosciences



New ProFume Low Range Monitor

- The CLIRcheck monitor utilizes **infrared technology** to measure sulfuryl fluoride (Vikane[®] gas fumigant) concentrations for **clearance and re-entry**
- The CLIRcheck features a warm-up time of about 12 minutes with a digital LCD readout and battery status indicator



Labeling Updates

ProFume gas fumigant in the United States

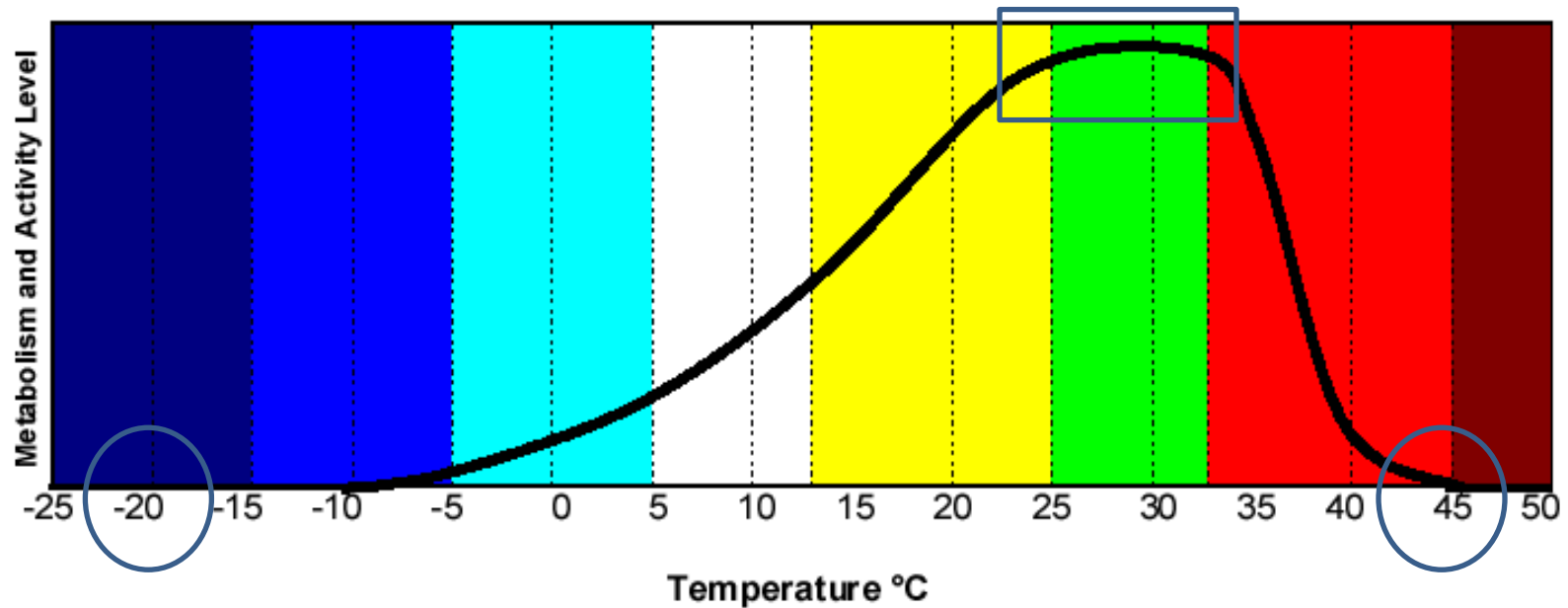
- > Residue tolerances for food expanded in US
- > Export log fumigation approval pending
- > Europe has an issue with food tolerances with Sulfuryl fluoride

Training for fumigators will be provided on the new labeling changes



Temperature & Insect Biology

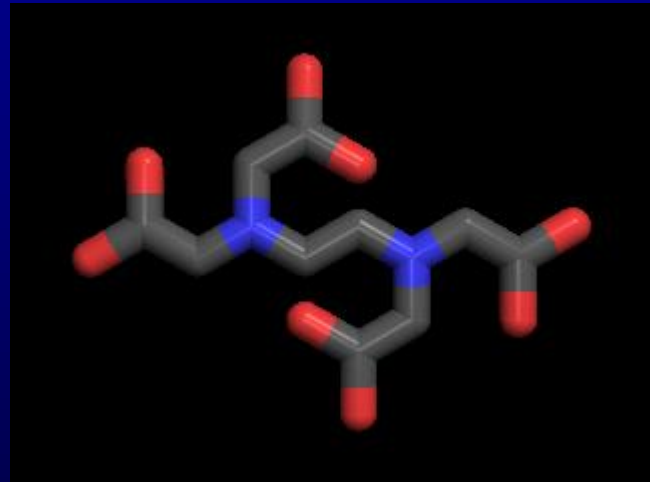
Response of Stored Product Insects to Temperature



Ethylenedinitrilo



- EDN
(New fumigant from BOC)



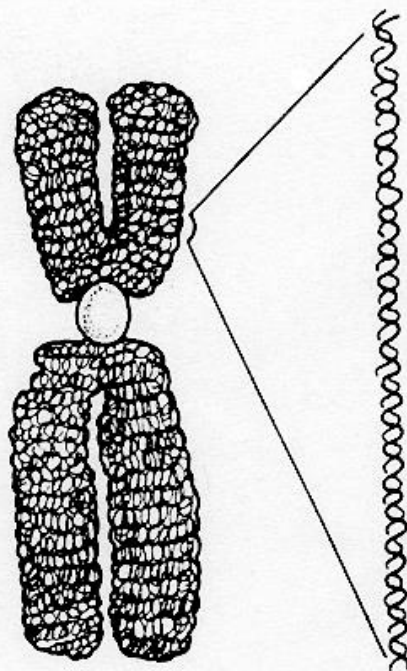
BOC Sydney researching EDN for
Soil, Timber and Fruit fumigations.

Sydney



Phosphine Insect Resistance

Chromosome Gene



Insect Resistance is Genetically Linked



Flat/Rusty Grain Beetle

Cryptolestes spp.



Lesser Grain Borer

Rhyzopertha dominica

100%

3200 PPM



Red Flour Beetle

Tribolium castaneum

89%



Rice Weevil

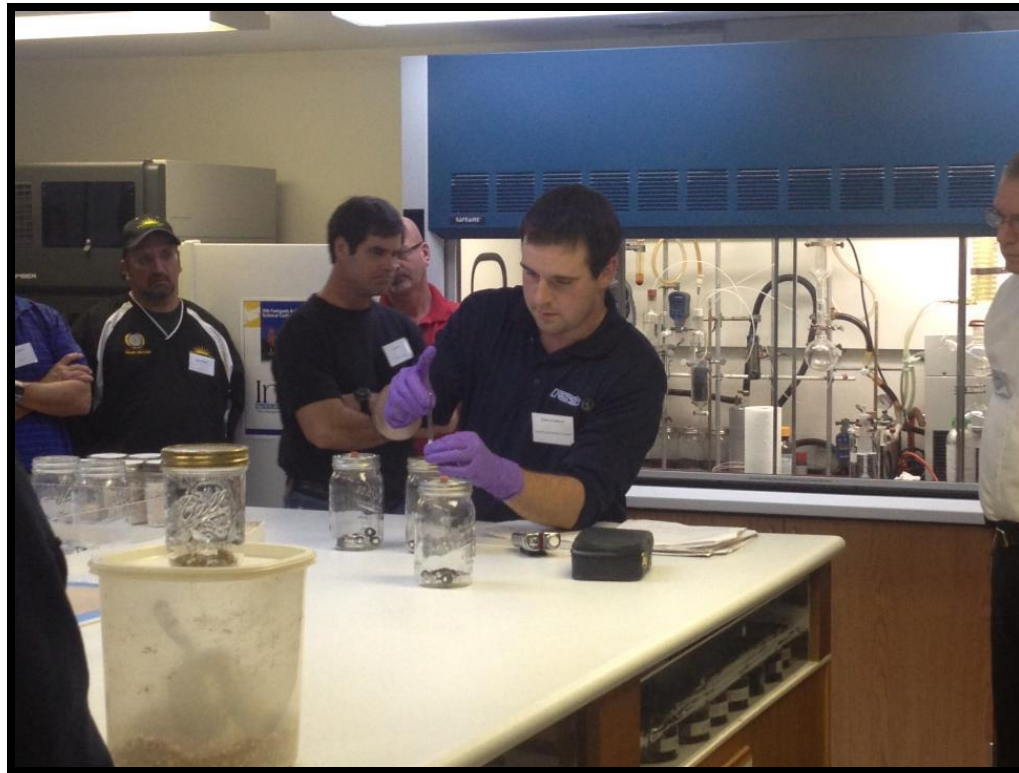
Sitophilus oryzae





Laboratory Test

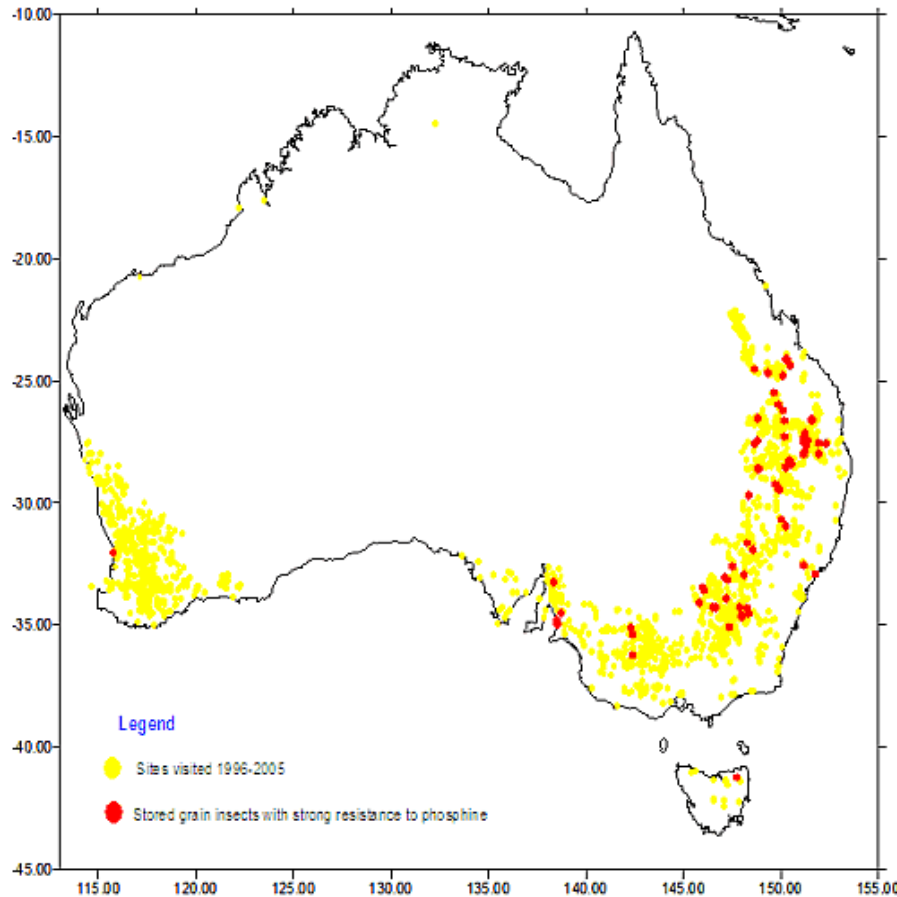
- ▶ **FAO United Nations Method: 20 hour lab test**



Pasta testing, Canada and Italy



The Australian Story



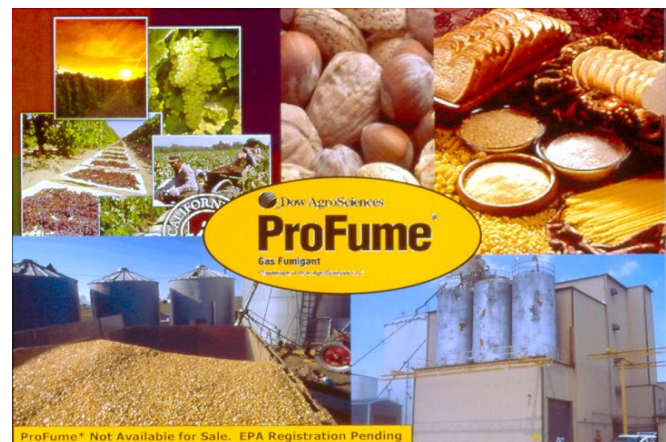
Ryzopertha dominica



FSS

Advantages of Resistance Testing

- ✓ Level of Resistance ?
- ✓ Dosage Rate and Duration
- ✓ National and Global Survey
- ✓ Recommendation Not to Use
- ✓ Rotation to Alternatives





Key Points

- ▶ Some insects have developed a genetic resistance to phosphine fumigations
- ▶ Phosphine fumigant resistance has increased in both frequency and strength worldwide
- ▶ Phosphine fumigant management starts with phosphine resistance testing.



Insect Samples pre 1960's



PH₃ Resistance Testing

A photograph of three men shaking hands in a dimly lit room with ornate chandeliers. The man on the left is seen in profile, wearing glasses and a light blue shirt. The man in the center is older, wearing glasses, a dark blue vest over a light blue shirt, and has his mouth open as if speaking. The man on the right has a beard and is wearing a brown jacket and a blue and white striped scarf. They are all smiling and shaking hands. The background is dark with several glowing chandeliers.

INVITATION
12th Fumigants & Pheromones
Technical Conference

March 6-9, 2016
Adelaide, South Australia