

Update on Residuals and Aerosols in Structures

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During This Conference

- You will hear presentations on aspects of heat treatments
- You will hear talks on insect monitoring, control
- Where do contact insecticides and aerosols fit in with whole-plant treatments?

Integrated Pest Management

- We generally think of starting on a small scale, then becoming more broad
- Might see this as going from contact sprays, then to aerosols, and then fumigation
- There will be several presentations on fumigation

Contact Insecticides

- General surface: can be used anywhere in the facility
- Crack & crevice: direct spray band into the opening
- Spot: usually defined as 2 ft² or less, restrictions on number of “spots”

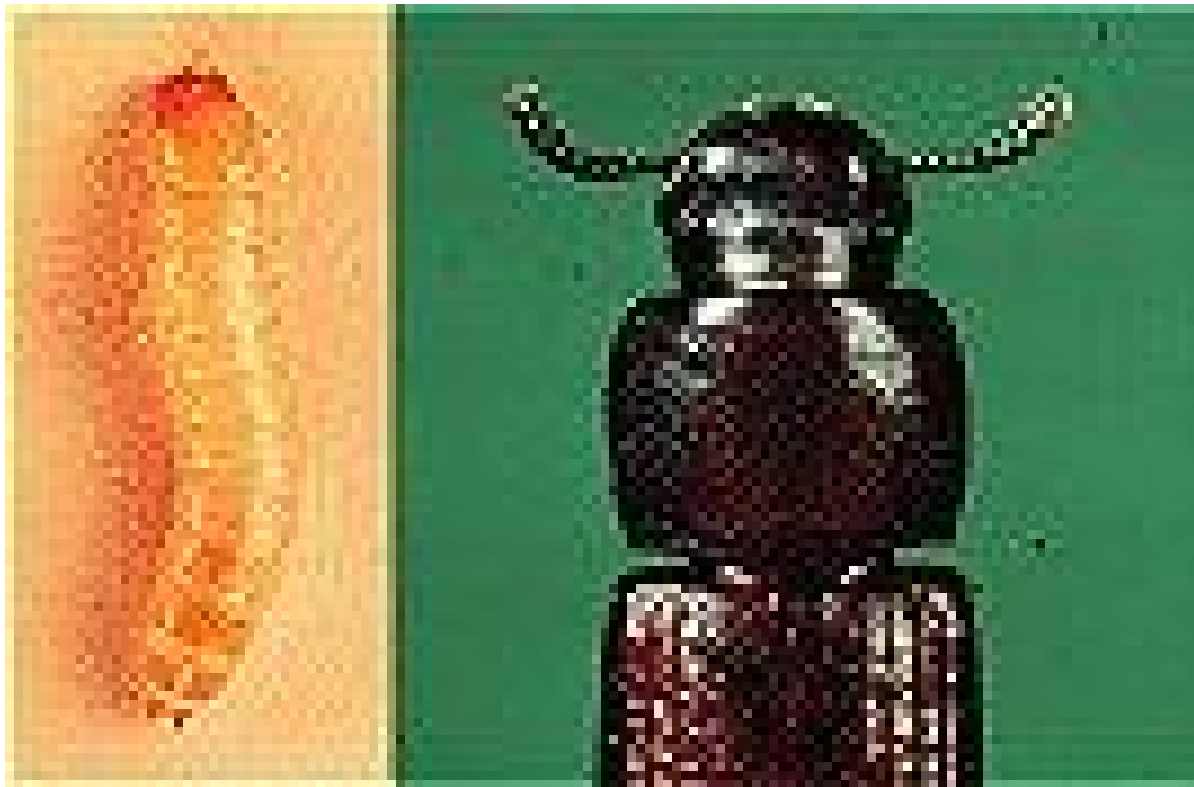
Factors Affecting Performance

- Insect species vary in susceptibility, red and confused flour beetles fairly tolerant
- Some insecticides, and formulations, are better than others
- Perhaps the biggest factor is the presence of food during or after insecticide exposure

Red flour beetle (RFB)
Tribolium castaneum



Confused flour beetle (CFB)
Tribolium confusum



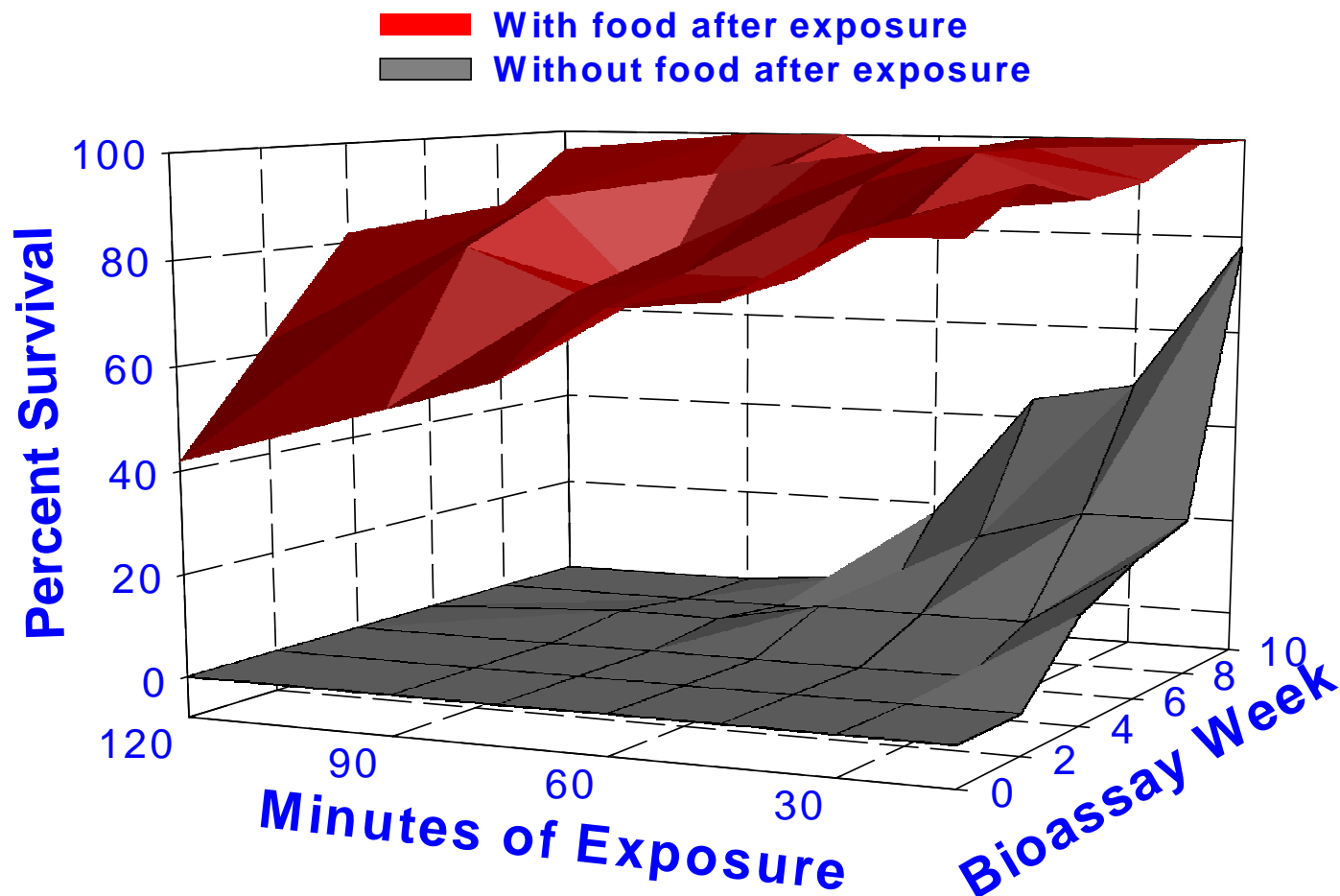
Why These Species?

- Common pests of stored food
- These species are generally more difficult to kill than smaller beetles
- CFB adults do not fly, RFB adults fly at ~80-85°F, minimizes escape into facility

Example 1

- Studies with cyfluthrin (Tempo) WP
- Adult red flour beetles exposed for 15 - 120 minutes on treated concrete
- Removed, held for 1 week, either given food or not given food
- Residual tests conducted for 0-10 weeks

Red flour beetle on concrete treated with cyfluthrin WP, 3.8 mg [AI]/ft²



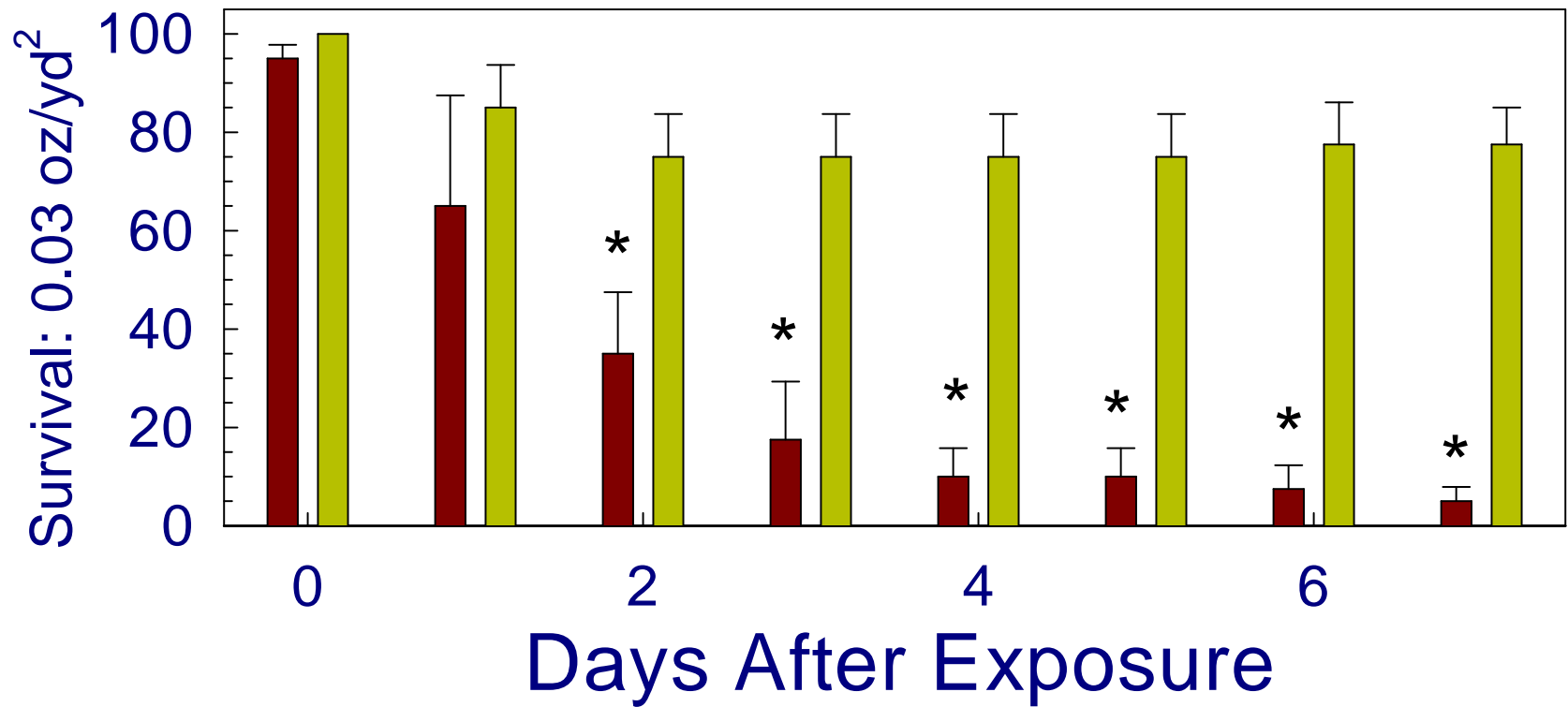
Example 2

- Chlorfenapyr (Phantom)
- Termiticide, BASF sponsored studies to evaluate residual efficacy for stored-product insects
- Red flour beetle and confused flour beetle are now on the pesticide label

Presence of Food

- Red flour beetles exposed on concrete treated with Phantom (different rates and times)
- Either given a flour food source or not given food after exposure
- Increase in survival with food; example shown is maximum label rate, 8 hour exposure time

% RFB survival, 8-h exposure



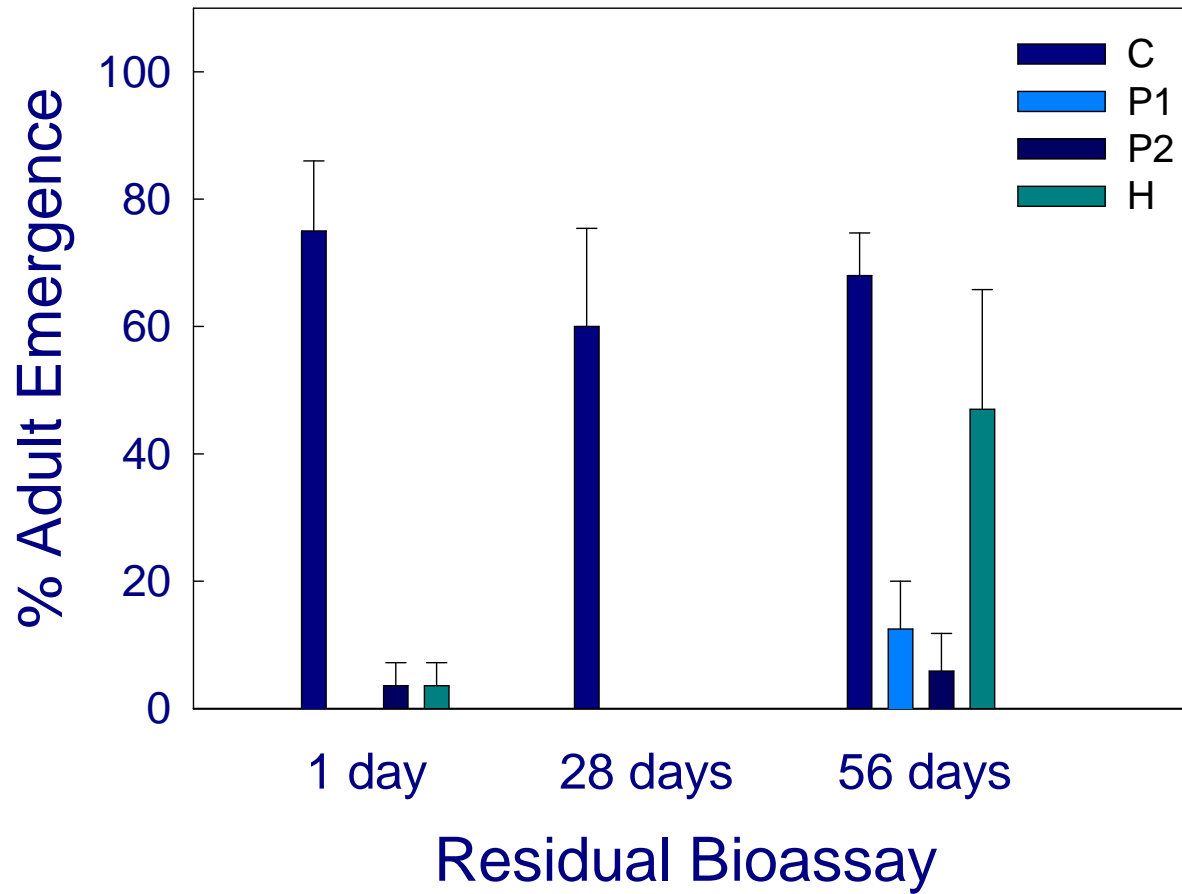
Example 3

- Residual studies with pyriproxyfen (NyGuard) as a surface treatment
- Laboratory tests in cooperation with Tom Phillips, then at Oklahoma State, now at KSU
- Research publication in press

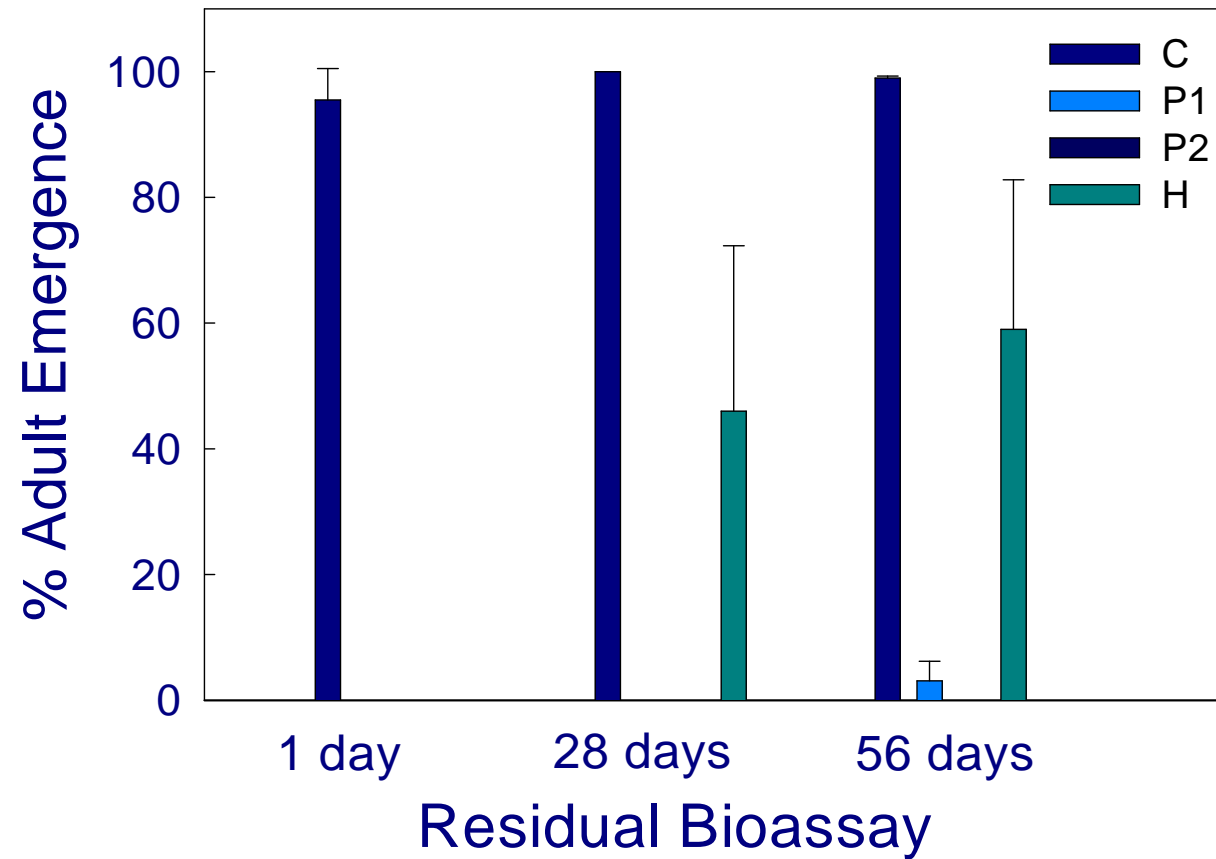
Lab Tests With NyGuard

- Controls (C), 23 mg AI/yd², (Gentrol, H) and 1.4 and 2.7 mg AI/yd² pyriproxifen (P1 & P2)
- Late-instars of several species exposed on treated surfaces, bioassays at 1, 28, 56 days
- Data reported for concrete; red flour beetle and confused flour beetle

Red Flour Beetle



Confused Flour Beetle



Results For Pyriproxyfen

- Greater residual control than hydroxyflorfen, results consistent with data for methoxyflorfen
- Variation among test insects consistent with laboratory studies with IGRs
- Field results likely different due to sanitation, foot traffic on surfaces, more wearing

Aerosols/Fogs/ULV Defined

- Aerosols (Fogs, ULVs) are liquid formulations, atomized and applied through a nozzle
- Kill exposed flying or crawling insects
- They do not penetrate food material, packaging, equipment, etc. (Not Fumigants)
- Aerosols and fumigants sometimes are used interchangeably

Field Trials

- Active commercial food storage facility
- Tests conducted in one room, approximately 225'L x 75'W x 35'H (600,000 ft³)

Partial View of the Test Room



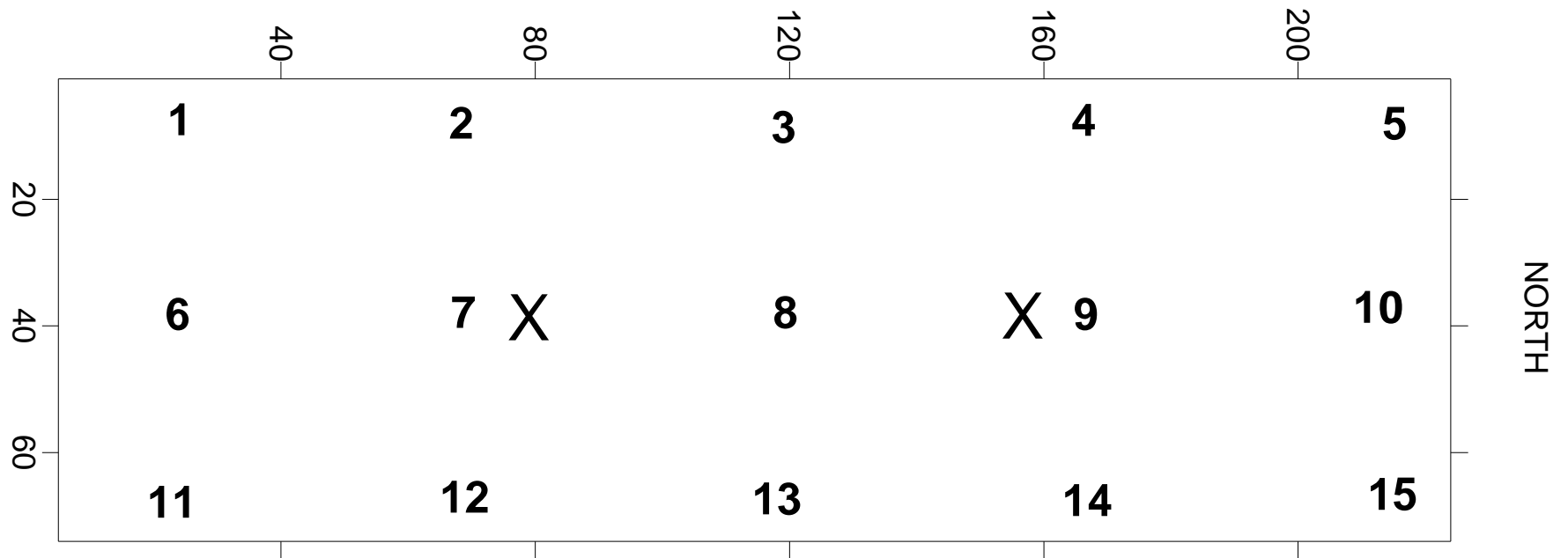
ULV System

- An installed ULV system on a timer, dispensed particle size about 15 microns
- Insecticide was a mixture of 1% pyrethrin+ synergists, applications were made according to label specifications for this formulation
- Trials conducted on 5 different dates with the red flour beetle and the confused flour beetle

Methods of Exposure

- 15 positions on the floor of the testing area (5 on side walls, 5 in center, all front to back)
- Ten adult CFB and RFB exposed in dishes (lined filter paper); w or w/o 250 mg of flour; 4-week old larvae and pupae with flour
- Dishes exposed to ULV fog for 2 hours, controls were held in a separate room

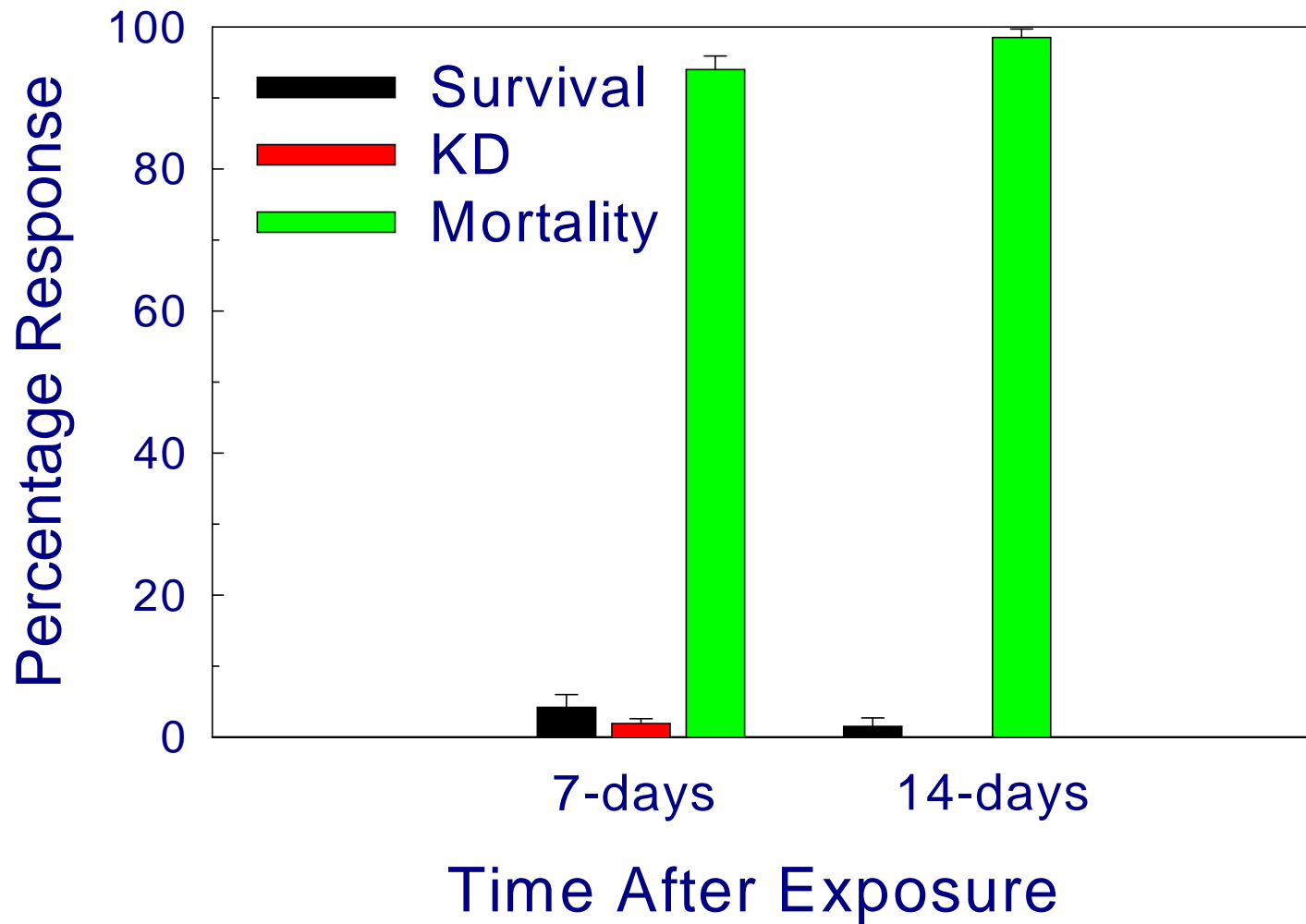
Position of Dishes, sets 1-5 and 11-15 between wall and pallets, X is nozzles



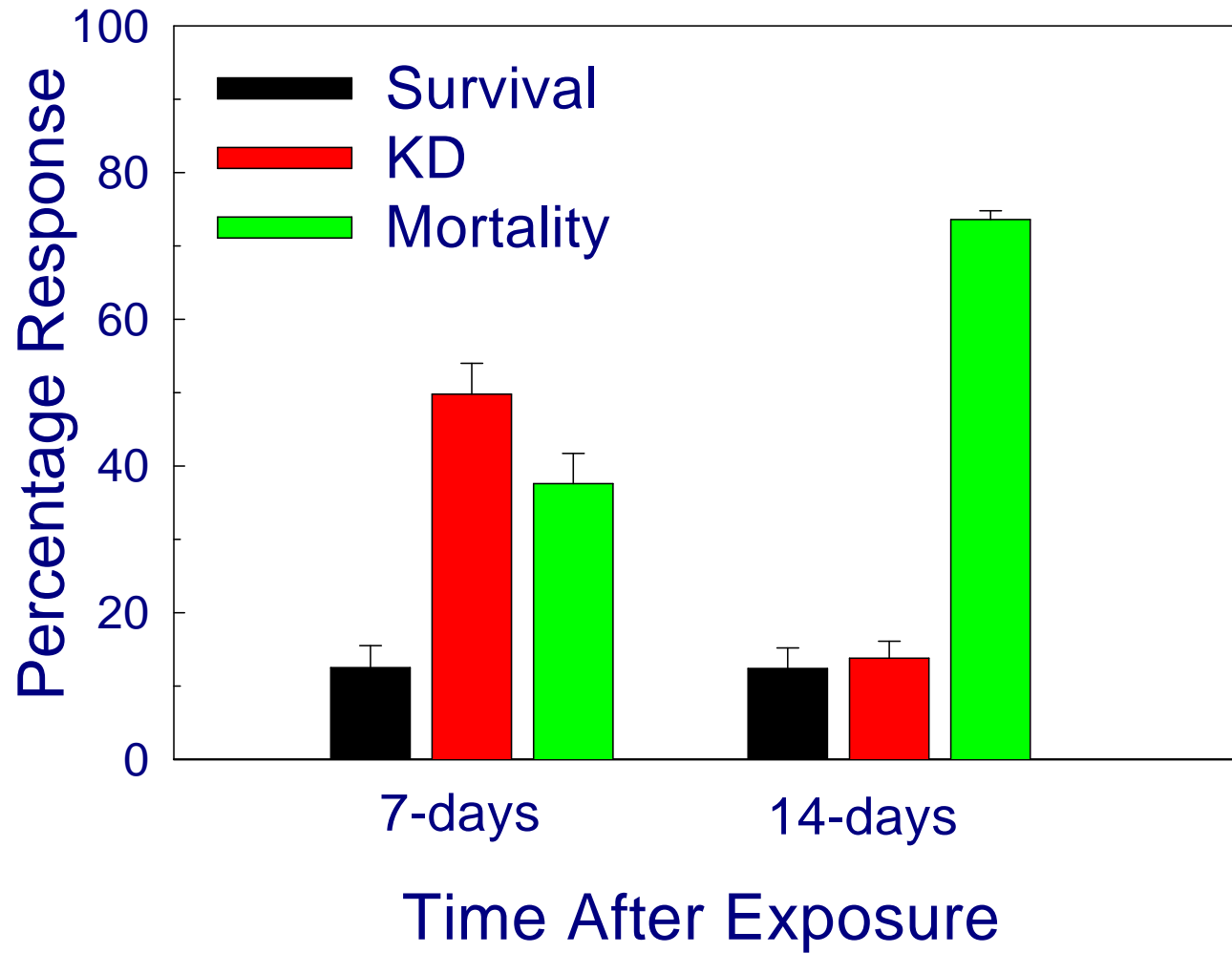
Fog distribution from 2 nozzles suspended from the ceiling



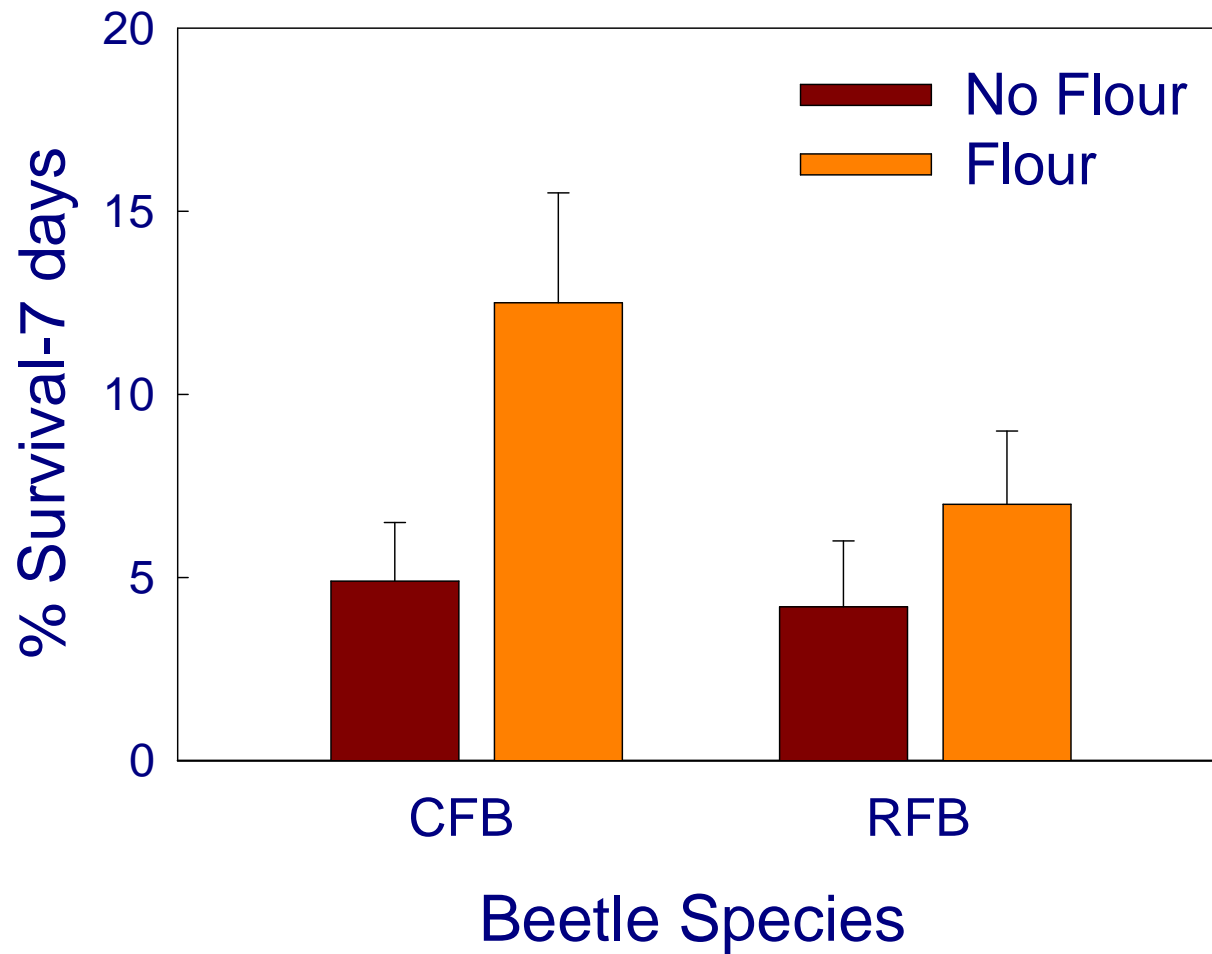
RFB Adults-No Flour



CFB Adults-No Flour



Adult Survival: Flour vs No Flour



Other Aerosols

- Different pyrethrin formulations, some pyrethroids (esfenvalerate-Conquer)
- Methoprene (Diacon II) and pyriproxyfen (NyGuard), insect growth regulators (IGR), are registered for aerosol application
- Still some use of dichlorvos (Vapona, DDVP)
- Application of a pyrethroid or pyrethrins combined with an IGR is common

2007 Studies

- Pyrethrin-pyriproxyfen (IGR NyGuard)
- Concrete arenas placed in open and closed positions at the floor and 12-ft high
- 4-week old larvae of red and confused flour beetles were exposed (with flour)
- Residual tests every 2 weeks for 10 weeks

Concrete Exposure Arena



Results

- No adult emergence of either species at any of the exposure positions (open or closed on the floor and at 12 ft. high)
- Residues were active for up to 10 weeks with complete control of the 4-week old larvae, none made it to the adult stage

2008 Studies

- Same insecticides and exposure conditions, residual tests done at 0-10 weeks
- Ten mixed-sex adult red flour beetles exposed for one week with 300 mg of flour
- Adults removed after 1 week, flour held for 6 weeks at 80°F-60% RH (standard rearing)

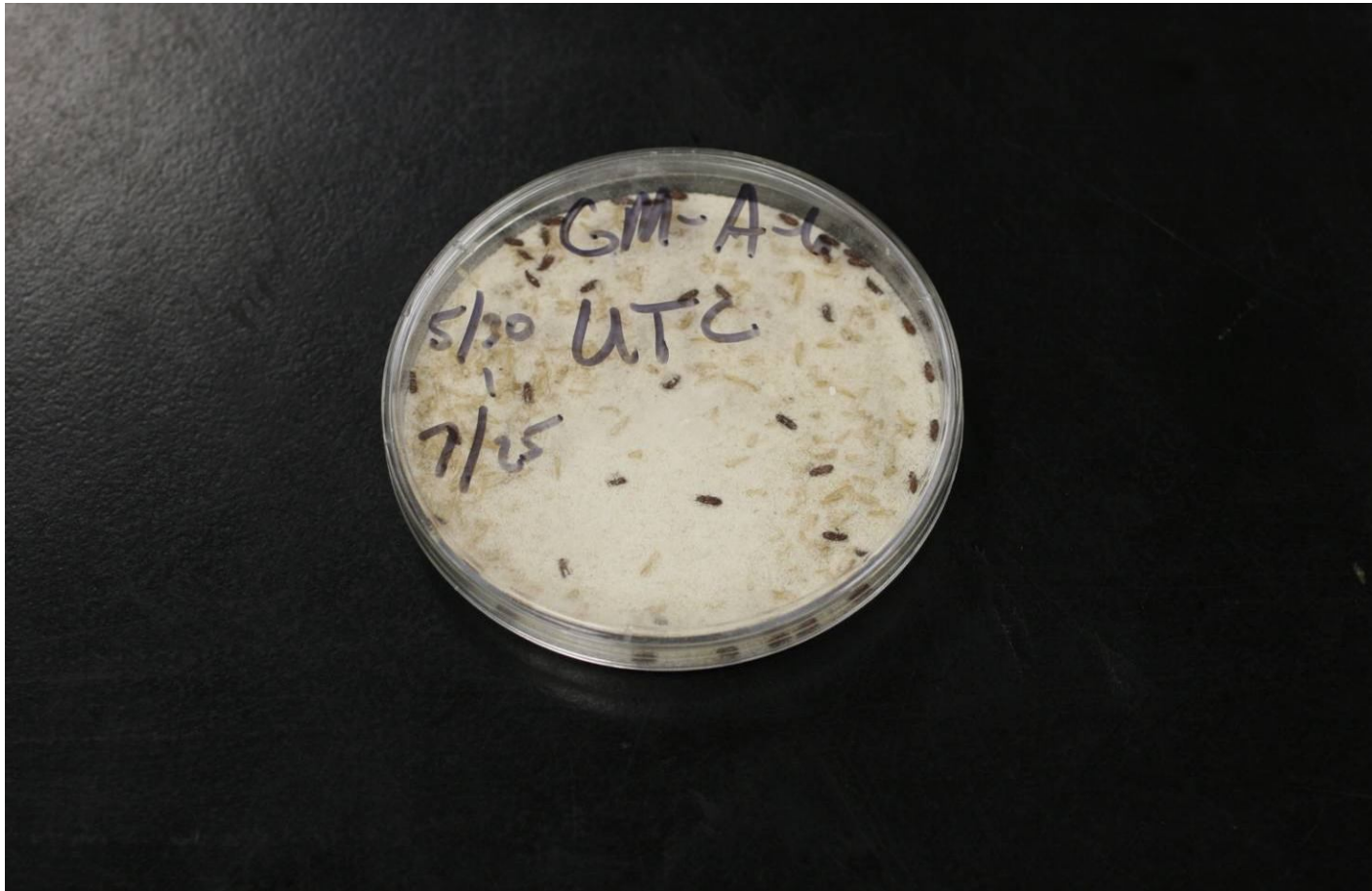
2008 Studies-Results

- No differences with exposure positions (open or closed on the floor and at 12 ft. high)
- No differences with weeks, residues were again active for 10 weeks

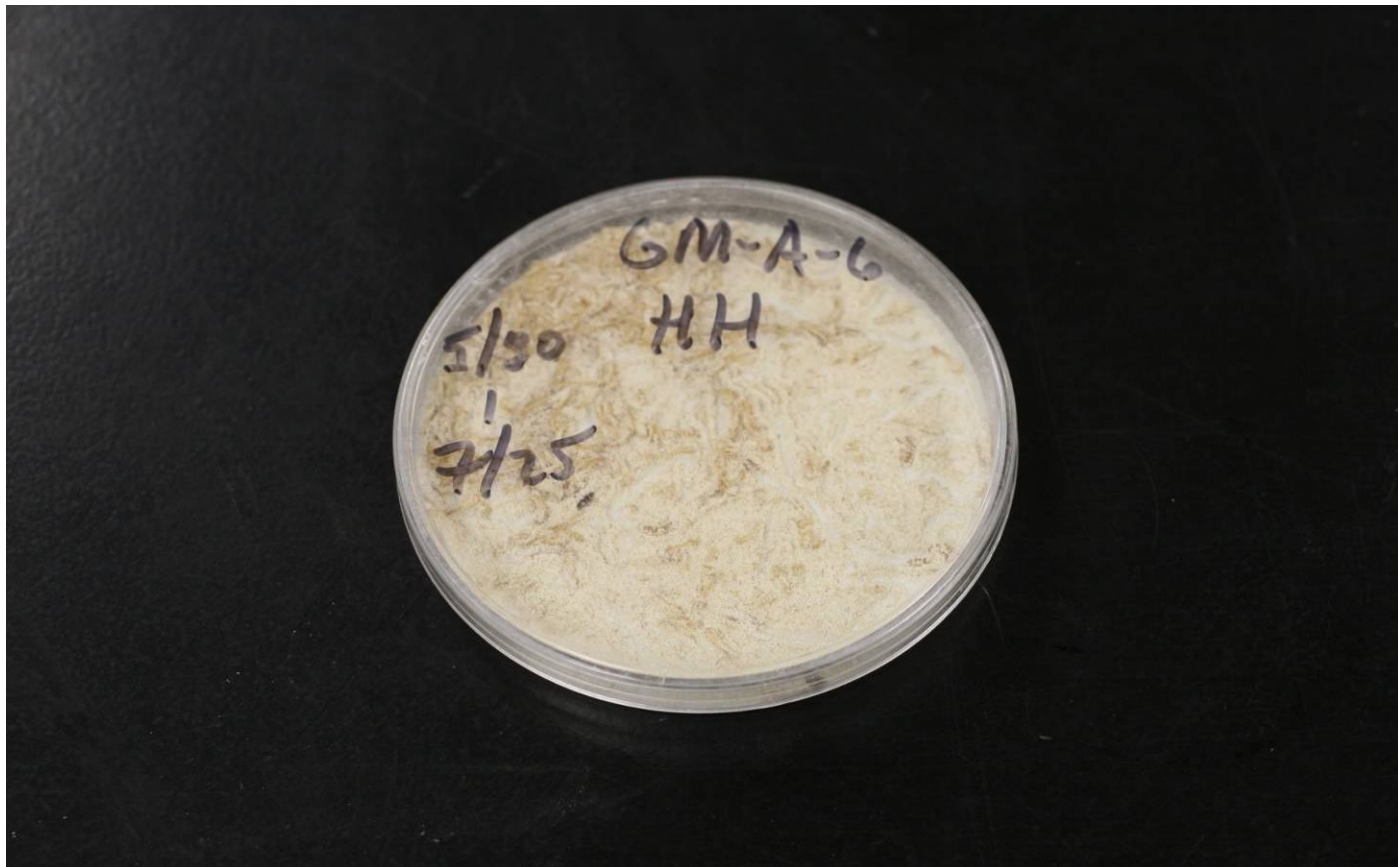
2008 Studies-Results

- Number of progeny adults in untreated controls averaged 26.0 ± 1.2
- Number of progeny adults in treatments averaged 0.07 ± 0.03 , even with an extra 4 week holding period
- 2,732 total adults in the untreated controls, only 8 in the treatments!

Control Arena



Arena Exposed to Aerosol



Barriers to IPM

- Cost and expense of monitoring (supplies, equipment, personnel)
- Multiple insect species of concern, pheromones often specific to one species
- Perhaps the biggest problem: people and attitudes regarding insects as pests

Overcoming Barriers to IPM

- Monitor smaller areas or key spots, intensify trapping when necessary
- Reduce costs by focusing on key species
- Try to identify the true economic cost
- People and attitude problems are the hardest to overcome

Attitude of “Management”

- No customer complaints = no problem
- Often there is little concern regarding insect populations
- Attitude is prevalent in storage, distribution, and retail sectors
- Is this a people issue or an insect issue?

Summary

- Surface treatments and aerosols are effective controls
- They can replace but probably not eliminate whole-plant treatments
- We need much more research in actual field sites and commercial facilities

For More Information

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