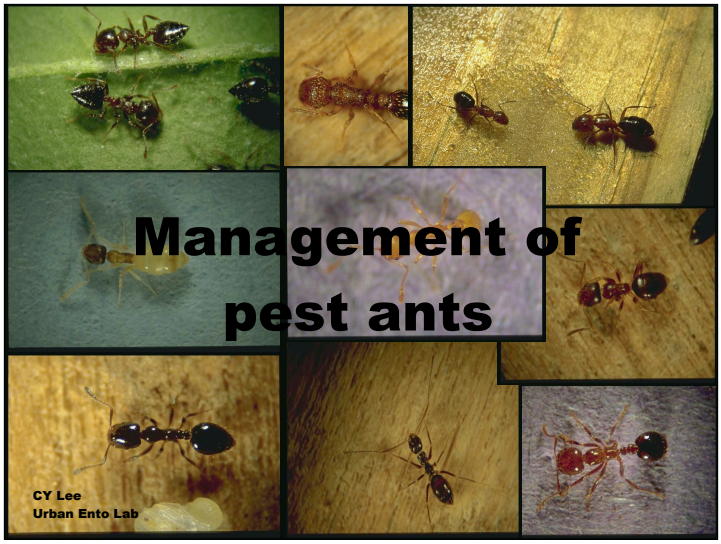


Introduction

- Ant management requires diligent efforts and the combined use of mechanical, cultural, sanitation, and often chemical control methods.
- It is unrealistic and impractical to attempt to totally eliminate ants from an outdoor area.
- Focus your management efforts on excluding ants from buildings or valuable plants and eliminating their food and water sources.
- Reducing outdoor sources of ants near buildings will reduce the likelihood of ants coming indoors.

INTRODUCTION

Best way to control: direct treatment.

Only 5 – 10% of total ant populations are out foraging at each time, thus treatment of foraging ants will not solved the problem.

The principle objectives in ant management:

- **To reduce activities**
- **To eradicate colony**

Principle of ant management

- Correct identification of ant species.
- Monitoring and identifying possible nest locations.
- Exclusion and sanitation
- Treatment strategies
- Post-treatment monitoring

Monitoring ants

- Regularly inspecting for ants or ant entry points is an important part of an IPM program.
- Monitor for ants near attractive food sources or moist areas.
- Ants may invade kitchens, bathrooms, offices, or bedrooms. Inspect under sinks, in cupboards, and along pipes and electrical wires.
- Look for large trails of ants or for just a few stragglers. Straggling ants are scouts randomly searching for food or nesting sites.
- When you spot ant trails, try to follow the ants to where they are entering the building and to the nest if possible.
- Look indoors and outdoors for holes or cracks in foundations or walls that provide entry points to buildings.

Monitoring ants

Index card method (peanut butter & honey)

Exclusion and Sanitation

- Store attractive food items such as sugar, syrup, honey, and pet food in closed containers that have been washed to remove residues from outer surfaces.
- Rinse out empty soft drink containers or remove them from the building. Thoroughly clean up grease and spills. Remove garbage from buildings daily and change liners frequently.

Caulking against ants

- To keep ants out of buildings, caulk cracks and crevices around foundations and other sites that provide entry from outside.
- Ants prefer to make trails along structural elements, such as wires and pipes, and frequently use them to enter and travel within a structure to their destination, so look for entry points in these locations.
- Indoors, eliminate cracks and crevices wherever possible, especially in kitchens and other food-preparation and storage areas.

Exclusion and Sanitation

- Look for indoor nesting sites, such as potted plants. If ants are found in potted plants, remove the containers from the building, then place the pots for 20 or more minutes in a solution of soap and water
- Submerge so the surface of the soil is just covered by the water-soap solution.
- Outdoor ant nests may be associated with plants that support large populations of honeydew-producing insects such as aphids, soft scales, mealybugs, or whiteflies.
- Try to keep plants, grass, and mulch several inches away from the foundation of buildings, because these items provide nesting sites for ants.
- Fix leaky faucets and sprinkler heads; these attract thirsty ants.

Treatment strategies

- Barrier treatment
- Baiting

Barrier treatment

Application of liquid or granular insecticides around building perimeters to prevent entry of ants.

However, if the infestation is inside the structure, it may worsen the problem as it will force the ants to remain in the structure.

Use of repellent (eg. deltamethrin, cypermethrin, cyfluthrin) or non-repellent insecticides (eg. fipronil, chlorfenapyr).

Factors affecting barrier treatment: temperature, moisture and ground cover.

http://www.shurkill.com/images/large/power-spraying.jpg

Limitation of barrier treatment

Kill primarily worker ants.

Lack of residual activity (in comparison to bait).

Requires thorough application.

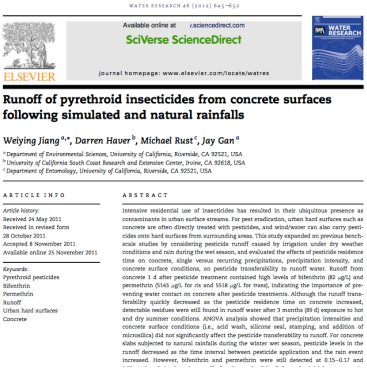
High application cost.

Potential effects on beneficial and non-target organisms.

Colony fragments may be disturbed by insecticide application, resulting in sociotomy.

Environmental issue associated with barrier treatment against ants

- Urban runoffs.
- Earlier was the issue with pyrethroids: 55 ton of bifenthrin, and 240 ton of permethrin used in 2004.
- In 2011, licensed California applicators used 28,785 kg fipronil, compared to 300 kg in 2000.
- This rapid increase has caused fipronil contamination in urban waterways and aquatic toxicity. Fipronil could be detected in almost all urban runoff samples from southern California.



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Runoff of pyrethroid insecticides from concrete surfaces following simulated and natural rainfalls

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ABSTRACT

Intensive residential use of insecticides has resulted in their ubiquitous presence as contaminants in urban surface streams. For pest eradication, urban hard surfaces such as concrete are often directly treated with pesticides, and wind/water can also carry pesticides onto hard surfaces from surrounding areas. This study expanded on previous bench-scale studies by considering pesticide runoff caused by irrigation under dry weather conditions and rain during the wet season, and evaluated the effects of pesticide residence time on concrete, single versus recurring precipitations, precipitation intensity, and concrete surface conditions, on pesticide transferability to runoff water. Runoff from concrete 1 d after pesticide treatment contained high levels of bifenthrin (82 μg/L) and permethrin (5143 μg/L for cis and 5518 μg/L for trans), indicating the importance of preventing water contact on concrete after pesticide treatments. Although the runoff transferability quickly decreased as the pesticide residence time on concrete increased, detectable residues were still found in runoff water after 3 months (89 d) exposure to hot and dry summer conditions. ANOVA analysis showed that precipitation intensities and concrete surface conditions (i.e., acid wash, silicone seal, stamping, and addition of microsilica) did not significantly affect the pesticide transferability to runoff. For concrete slabs subjected to natural rainfalls during the winter wet season, pesticide levels in the runoff decreased as the time interval between pesticide application and the rain event increased. However, bifenthrin and permethrin were still detected at 0.15–0.17 and

Baiting

Baits -- taken back to the nest and passed to other colony members via trophallaxis -- result in colony suppression or even elimination.

Effective bait should be: palatable, and contains slow-acting toxicant (eg. hydramethylnon, indoxacarb, boric acid, sulfluramid, fipronil, thiamethoxam, etc).

Baits can be delivered in 4 forms: (1) liquid, (2) gel, (3) paste, and (4) granules.

A good ant bait must be…

- **Slow acting** - insecticide active must not kill immediately — problems with avoidance — ants could associate death of nestmates with food that they have taken.
- **Palatable** (non-repellent) — food attractant must be palatable, attractive to the worker ants.
- Preferred bait formulation

Bait formulation preference

Four most common types of ant bait formulations: liquid, paste, gel and granules.

Different ant species prefer different bait formulations.

Most household ants prefer liquid-based bait, except Big-headed ants (BHA) and Fire ants (FA).

BHA and FA prefers granular baits.

Particle sizes of granular baits also affect bait preference.

Preferred size: 800 – 2000 μm in diameter.

Bait base preference of the common urban pest ants*

Species	Bait formulation			
	Liquid	Gel	Paste	Granule
M. pharaonis	High	High	Moderate	Moderate
M. floricola	High	High	Poor	Poor
M. destructor	High	Moderate	Moderate	Moderate
M. orientale	High	High	Poor	Poor
T. indicum	High	High	Poor	Poor
T. melanocephalum	High	High	Poor	Poor
A. gracilipes	High	High	Poor	Moderate
P. longicornis	Poor	Poor	Poor	High
P. megacephala	Poor	Poor	Poor	High
S. geminata	Poor	Poor	Poor	High

*based on Lee (2002) and Lee (2008)

Findings

- All bait formulations demonstrated >75% reduction in ant counts within a week against all *Monomorium* spp.
- Limited control was recorded against Pheidole.
- Although good control was recorded with most bait toxicants, limited success was registered when baiting crazy ants and ghost ants with paste and granular baits.
- This concurs well with that reported by Hedges (1998).

Matrix base affects bait performance against pest ants

Ant	active ingredient	formulation	% reduction at (weeks)		
			1	4	8
Pharaoh	hydramethyln. (1%)	paste (1)	82	95	58
	hydramethyln (1%)	paste (2)	90	90	100
	hydramethyln. (1%)	paste (3)	90	85	90
	fipronil (0.01%)	paste	92	95	80
	fipronil (0.001%)	gel	95	100	100
	borate (5.3/4.3%)	paste	75	70	70
	imidacloprid (2.15%)	gel	95	90	80
Pheidole	fipronil (0.01%)	paste	65	75	85
	borate (5.3/4.3%)	paste	40	65	100
	methoprene	granule	50	85	100
Crazy	hydramethyln. (1%)	paste	65	70	70
	fipronil (0.01%)	paste	70	79	65
	fipronil (0.001%)	gel	90	95	95
Ghost	hydramethylln. (1%)	paste	60	75	65
	fipronil (0.01%)	paste	78	85	60
	fipronil (0.001%)	gel	95	100	100

Granular versus Gel Baits
(note that both baits are

Choice of bait formulation

Liquid/gel	Granular	Paste
Tapinoma melanocephalum	*A. gracilipes.*	*M. pharaonis**
T. indicum	*M. pharaonis.*	*M. floricola**
Camponotus spp.	*M. floricola.*	
M. pharaonis.	*M. destructor.*	
M. floricola	*S. geminata*	
M. destructor.	*P. megacephala.*	
	Tetramorium spp.	

*moderately effective only.

ANT BAITING 1-2-3

Identify the ant species involved.
Put out baited index cards in the premise to determine the possible areas of infestation.
Rmove all possible food and water sources that may compete with bait.
Put out bait stations (or apply gel baits) in the infested location.
Post-monitoring inspection using index cards to check reduction in ant foraging activities.

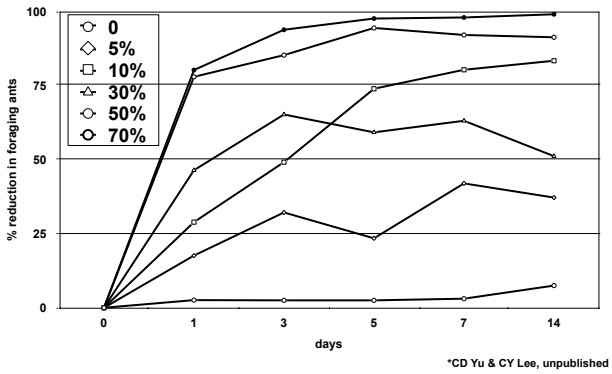
ANT BAITING TIPS

- **Place baits as closely as possible to ant colony.**
- **Place baits along edges and corners since ants like to trail along the side of wall.**
- **Remove all potential food and water sources.**
- **Do not place baits on insecticide-treated surface.**
- **Switch to another bait after some time.**

Effects of number of poisoned workers on colony elimination

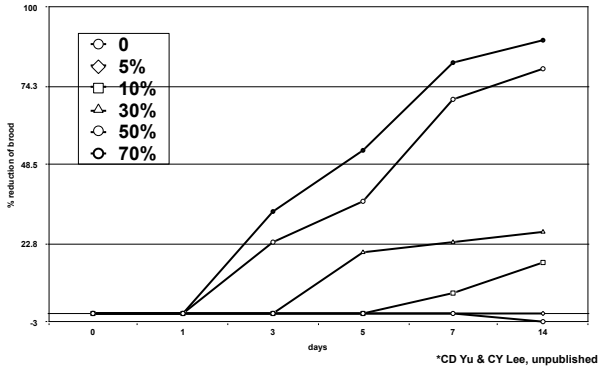
- 0.001% fipronil in 10% sucrose solution with dye.
- Introduced to Pharaoh's ant workers.
- The dyed workers are later transferred to colony containing all castes at the following % of poisoned workers: 0 (control), 5, 10, 30, 50, 70%.
- Mortality numbers for workers, brood, queen were scored at selected time intervals.
- Results suggested that a minimum of 50% total workers must be poisoned to achieve good reduction of workers and brood numbers within 1 week post-treatment.
- Thus, this study indicated that it is important to increase the number of workers consuming baits, and this can be achieved by:
  1. Increasing bait placements.
  2. Increasing bait palability and taking consideratin of ant food preference.
  3. Baiting at ant trails.

Effects of % poisoned workers on total worker mortality*



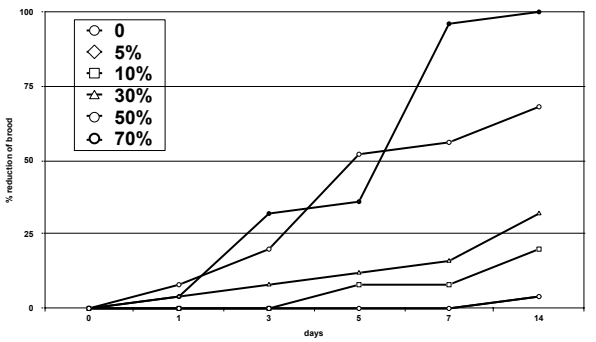
*CD Yu & CY Lee, unpublished

Effects of % poisoned workers on total brood mortality*



*CD Yu & CY Lee, unpublished

Effects of % poisoned workers on total queen mortality*

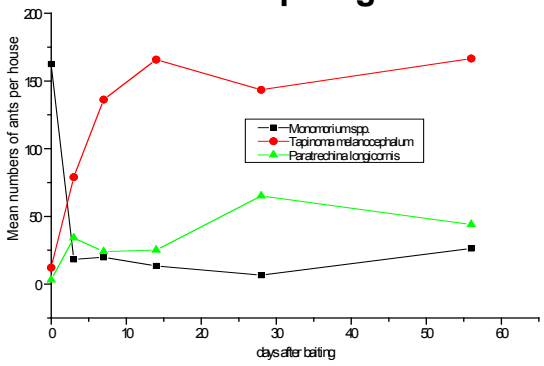


*CD Yu & CY Lee, unpublished

Occurrence of secondary pest species / Species territoriality

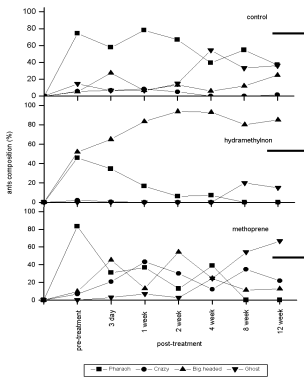
- Several species can occur within a living unit at any time.
- Some species are more aggressive than the others.
- Upon elimination of one species, another species may become more prevalent, particularly those that are not responsive to bait effect.
- The following study was observed when baiting *Monomorium* spp. with imidacloprid gel bait:

Changes in foraging ant species upon baiting *Monomorium* spp. with imidacloprid gel bait



Changes in foraging activity of pest ants upon introduction of baits

(Lee et al. 2003 - *Sociobiology* 41: 717 - 723)



Unbaited location showed seasonal fluactuation of pest ant activity with Pharaoh's ant being the most predominant

After baiting with hydramethylnon bait, Pharaoh's ant population reduced, but Big headed ant population increases.

Baiting with methoprene granular bait caused reduction in Pharaoh's ant population, but increase in ghost ant population.

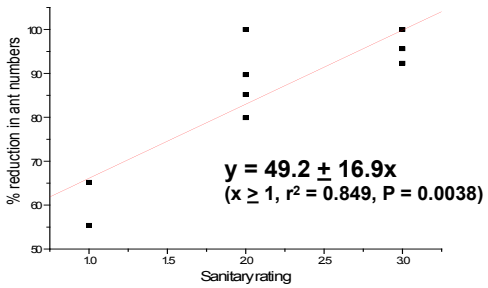
Effects of sanitation

- **Rating for houses:**

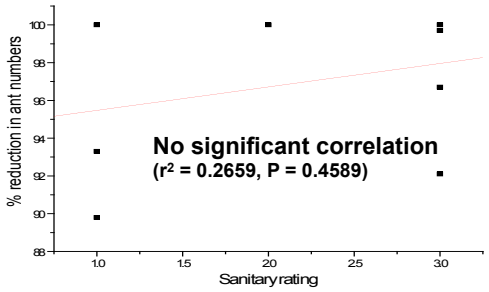
1 = poor, 2 = moderate and 3 = good.

- **Houses baited with either bait stations (3 pieces), or gel bait (55 dabs of 0.09 g).**
- **Total amount treated per house = 4.95 g.**
- **Positive correlation in houses treated with bait stations.**
- **No correlation in houses treated with gel baits.**

Relationship between containerized bait performance and sanitary condition



Relationship between gel bait performance and sanitary condition



Implication

Sanitary condition affects bait performance, but its effect can be lessened (even negated) with greater bait placement