

## Worker Ant Foraging Response On and Near Mounds of the Red Imported Fire Ant

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The red imported fire ant, *Solenopsis invicta* Buren (Hymenoptera: Formicidae), is a major exotic invasive pest ant species in the southern U. S. and in other countries where it has been accidentally introduced from its South American homeland (Oi and Drees 2009). Management often relies on results of ant monitoring using food lures and the use of granular bait formulated insecticide products (Drees 1998, Drees et al. 2006). Placement of food lures such as slices of hot dogs, or ant bait to treat individual mounds may affect response by foraging red imported fire ant workers. Directions for most ant bait products require placement around, not on top of, ant mounds in which colonies nest. The concept relies on the theory that these ants do not forage for food directly on top of their mounds. This trial was conducted to assess response to a food lure bait in relation to the center of the nest.

### Materials and Methods

Mound sites were selected for study in Dallas and Brazos Counties, Texas. In Dallas Co. on the grounds of the Texas A&M Research and Extension Center, six colonies were monitored June 5, July 11, August 3, September 11, and October 25, 2007. Slices of hot dogs (Bar-S), roughly 1/8 inch thick, were placed on top of each mound, and along a transect at intervals of 1, 3 and 6 ft away from the mound's center. The number of foraging worker ants on the hot dog slice was identified and estimated in the field after 0, 15, 30 and 60 minutes. Results were averaged and graphed for each date and then summarized for the 5 dates. Environmental conditions were documented, including time, relative humidity, air and soil temperature and wind speed.

In Brazos Co., at the Pecan Genetics Lab, USDA, Hwy 50, methodology used was similar to that used in Dallas County. However, only two fire ant mounds were monitored on each date, and ants were estimated at food lure stations after 0, 5, 15, 30 and 60 minutes. Most assessments were performed sequentially rather than simultaneously as in Dallas County.

### Results

Temperatures and other environmental conditions during the assessments in Dallas County were all in the range for ant foraging (Drees et al. 2007)(**Table 1**). At all monitoring dates, the number of foraging worker ants attracted to the food lure was highest for hot dog slices placed directly on the top center of the ant mounds and decreased at the 6 ft distance from the mounds (**Table 2**). Ant numbers increased over the monitoring time period in all dates except July 11, when numbers declined after 45 minutes (**Figure 1**). During the June 11 assessment, at the 6 ft. placed food lure of one mound, another ant species, the little black ant (*Monomorium minimum* (Buckley)), rather than the red imported fire ant occupied the hot dog slice after 30 (50 ants), 45 (70 ants) and 60 (120 ants) minutes of placement. No other ant species were observed during these dates on any of the food lures.

Temperatures and other conditions during foraging assessments in Brazos County were also suitable (**Table 3**). Ant numbers associated with food increased over 60 minutes and there was not a significant difference in the number of foraging worker ants attracted to the hot dog slice placed directly on top of the ant mounds (**Table 4, Figure 2**). However, results were more variable and trends less clear in these assessments. A partial reason for the increased variability may have been that fewer mounds were used in these assessments than in Dallas County. However, another reason may have been native ant species interacting with red imported fire ant foraging. On 3 of the colonies used in this location other ants were observed:

1) On mound #2, Aug. 8, ten little black ants occupied the hot dog slice 1 ft from the mound center at 15 minutes, but were replaced by fire ants thereafter. Similarly on the slice 3 ft. from the mound, 13 little black ant workers and two fire ants were both present until fire ants overtook the native ant thereafter.

2) On mound #2, Sept. 18, little black ants occupied the hot dog slice placed directly on top of the fire ant mound, with their numbers first detected after 15 minutes of placement (50 ants), to 100 or more after 30 min., and increasing to over 200 ants thereafter. They were also documented on the slice 1 ft from the mound center after 45 min but displaced by fire ants thereafter. The little black ants had trailed mainly on stems of dead grass to the peak of the mound to gain access to the food lure.

3) On Mound #1, Sept. 18, both little black ant workers and a *Pheidole* species dramatically affected red imported fire ant (RIFA) foraging as shown in the chart below:

Time-minutes	Top center	1 ft from center	3 ft. from center	6 ft from center
0	0	0	0	0
5	0	0	0	0
15	0	100 small Pheidole	10 small Pheidole	0
30	0	100+ small Pheidole	4 small Pheidole	100+ Little Blk Ants
45	300+ RIFA*	30 RIFA only	10 small Pheidole	300+ Little Blk Ants
60	500+ RIFA	300+ RIFA only	2 small Pheidole	400+ Little Blk Ants

Presence of native ants at this site was higher than in Dallas County, demonstrating how competition at food lure sites can affect the foraging pattern of red imported fire ants.

## Discussion

Results of these efforts document that placement of a food lure such as a hot dog slice in proximity to red imported fire ant mounds, time after placement, and presence of other ant species can affect results of foraging worker ant numbers attracted. In general, results confirm the monitoring methods already suggested for red imported fire ants: place food lures either randomly or in a grid or circular pattern during moderate temperatures (65 to 95°F) and estimate foraging worker ant numbers after 45 to 60 minutes. This time interval seems to be optimum to document random foraging patterns of red imported fire ant and avoids recruitment of additional foraging ants to the food lure if left too long.

Results clearly demonstrate that red imported fire ants forage on top of their mounds or nests (as do other ant species on occasion). These data should convince insecticide manufacturers of bait-formulated insecticides to consider revising their user directions to

allow placement of the granular baits directly on top of undisturbed mounds in addition to scattering it around them. The possibility of developing bait stations deployed on top of or even inside ant mounds may hold promise as a target-specific fire ant treatment, particularly for insect growth regulator (IGR) active ingredient (Drees et al. 1992).

### **Literature cited**

- Drees, B. M. 1998. Survey-based management of red imported fire Ants. Fire Ant Plan Fact Sheet FAPFS007. Texas Imported Fire Ant Research & Management Project, Texas A&M University System, College Station, Texas. 2 pp.
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- Drees, B. M., B. Summerlin, and S. B. Vinson. 2007. Foraging activity and temperature relationship for the red imported fire ant. *Southwestern Entomologist* 32(3):149-156.
- Oi, D. H. and Drees, B. M. 2009. Chapter 30: Fire ant IPM. In *Integrated Pest Management* (E. B. Radcliffe, W. D. Hutchison and R. E. Cancelado, eds.) Cambridge Univ. Press, pages 390-401, 529 pages.

**Table 1.** Environmental conditions during 2007 foraging ant assessments in Dallas Co., TX.

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	<b>5-Jun</b>	<b>11-Jul</b>	<b>3-Aug</b>	<b>11-Sep</b>	<b>25-Aug</b>
<b>Conditons</b>	sunny	sunny	overcast	overcast	clear
<b>Time</b>	8-9 am	8:30-9:30	7:30-8:30	1:30 - 11:30	11-Oct
<b>Rh</b>	80%	100%	94%	30%	10%
<b>Air temp.</b>	74°F	76	82	74	70
<b>Soil temp.</b>	76	74	74	70	70
<b>Wind speed</b>	0-2 mph	5	0	15-20	25

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**Table 2.** Mean and standard deviation (S.D.) of estimated foraging red imported fire ant workers associated with a hot dog slice food lure placed 0, 1, 3 and 6 ft from the ant mound center over time, Dallas Co., TX, monitored 5 June, 11 July, 3 Aug., 11 Sept. and 25 Aug, 2007.

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	<b>0 min</b>	<b>15 min</b>	<b>30 min</b>	<b>45 min</b>	<b>60 min</b>
<b>0 ft</b>	3.00	25.00	66.33	88.00	93.75
S.D.	0.46	13.20	18.73	21.46	31.83
<b>1 ft</b>	0.00	7.33	38.33	59.17	57.958
S.D.	0.00	7.37	24.30	35.04	31.37
<b>3 ft</b>	0.00	4.50	36.33	60.50	55.79
S.D.	1.44	8.32	21.27	29.23	29.43
<b>6 ft</b>	0.00	3.50	26.00	44.83	53.21
S.D.	0.00	4.69	10.08	13.27	19.60

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**Table 3.** Environmental conditions during red imported fire ant foraging worker assessments, Pecan Genetics Lab, USDA, Hwy 50, Brazos Co., Texas, 2007.

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	<b>16-Jul</b>		<b>8-Aug</b>		<b>18-Sep</b>		<b>8-Nov</b>	
	<b>Mound 1</b>	<b>Mound 2</b>	<b>Mound 1</b>	<b>Mound 2</b>	<b>Mound 1</b>	<b>Mound 2</b>	<b>Mound 1</b>	<b>Mound 2</b>
<b>Conditons</b>	Bright, sunny	Bright, sunny	Overcast	Part cloudy	Clear, sunny	Clear, sunny	Cloudy	Cloudy
<b>Time</b>	9:00-10:05 a.m.	9:50-10:50	9:00-10:00	9:45-10:45	8:50-9:50	9:10-10:10	9:00-10:00	9:10-10:10
<b>Rh</b>	79%	79%	79%	76%	77%	77%	71%	71%
<b>Air temp.</b>	84°F	88	86	86	86	86	74	74
<b>Soil temp.</b>	81°F	82	81	84	-	-	70	70
<b>Wind speed</b>	light breeze	light breeze	light breeze	light breeze	calm	calm	light breeze	light breeze

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**Table 4.** Mean and standard deviation (S.D.) of estimated foraging red imported fire ant workers associated with a hot dog slice food lure placed 0, 1, 3 and 6 ft from the ant mound center over time, Pecan Genetics Lab, USDA, Hwy 50, Brazos Co., Texas, for July 16, Aug. 8, Sept. 18 and Nov. 8, 2007.

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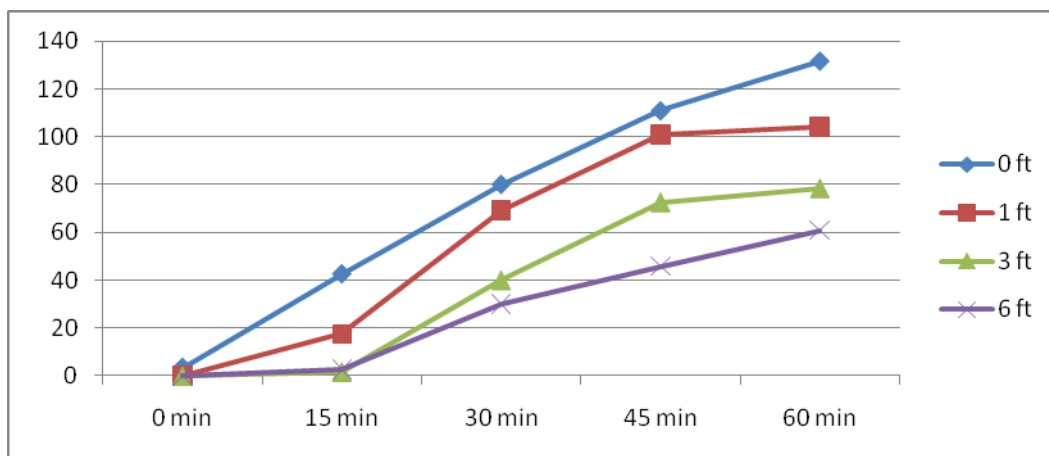
	<b>0 ft</b>	<b>1 ft</b>	<b>3 ft</b>	<b>6 ft</b>
<b>0 min</b>	1.25	0.00	0.00	0.00
S.D.	3.53	0.00	0.00	0.00
<b>5 min</b>	19.38	12.50	1.88	0.25
S.D.	36.86	23.15	5.30	0.71
<b>15 min</b>	125.63	172.88	37.50	42.63
S.D.	173.32	306.12	74.40	71.86
<b>30 min</b>	200.88	175.13	89.88	223.75
S.D.	84.64	120.41	38.33	82.27
<b>45 min</b>	300.00	191.25	128.38	269.00
S.D.	187.08	182.56	175.78	281.03
<b>60 min</b>	356.25	275.38	220.88	272.13
S.D.	206.05	202.96	270.57	278.57

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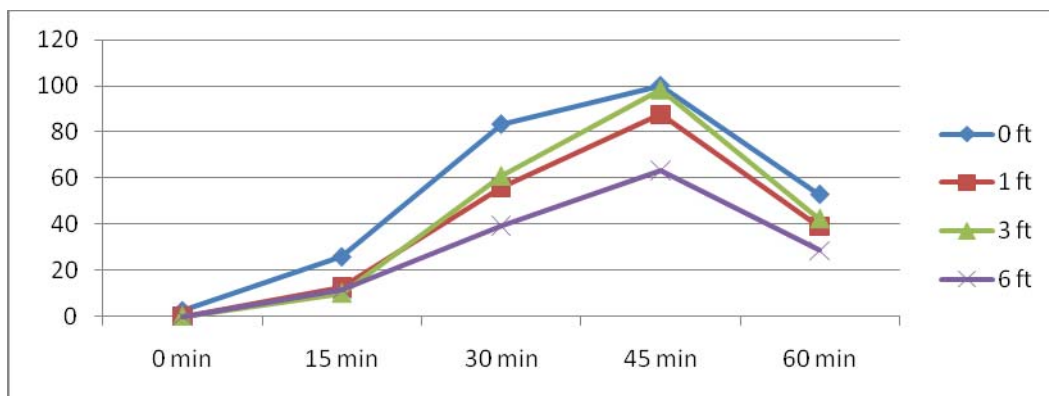
**Figure 1.** Mean of estimated foraging red imported fire ant workers associated with a hot dog slice food lure placed 0, 1, 3 and 6 ft from the ant mound center over time, Dallas Co., TX, monitored 5 June, 11 July, 3 Aug., 11 Sept. and 25 Aug, 2007.

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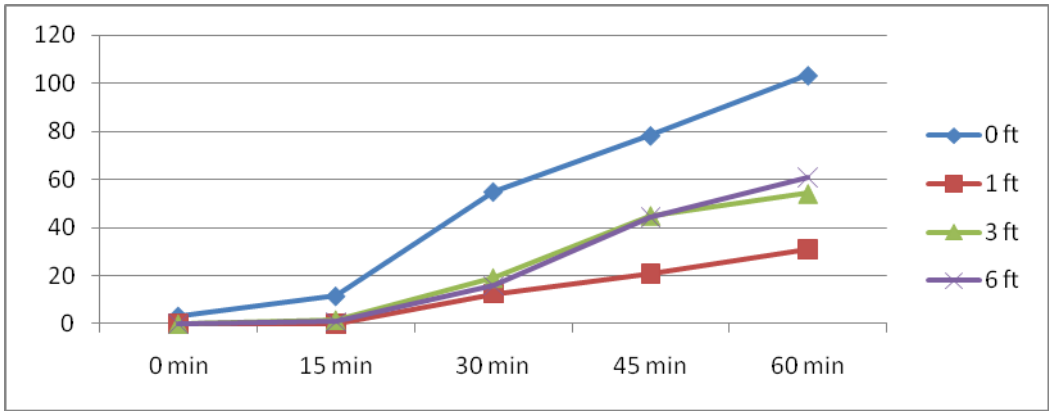
June 5 (n = 6 ant mounds at each time interval and distance)



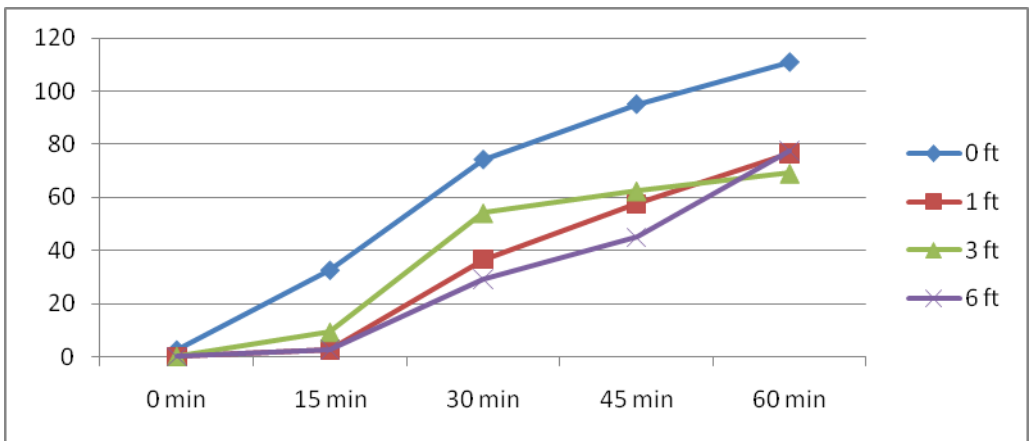
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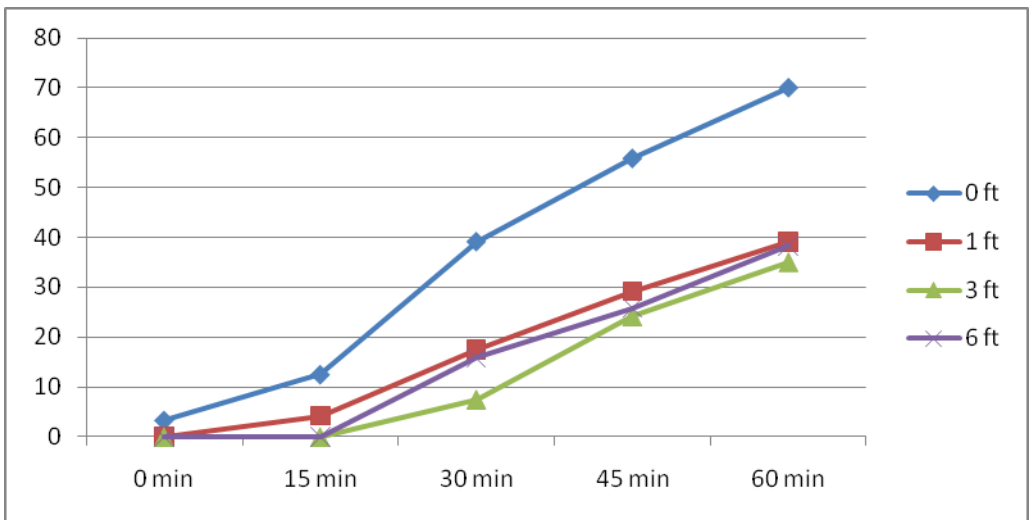
Aug. 3



Sept. 11

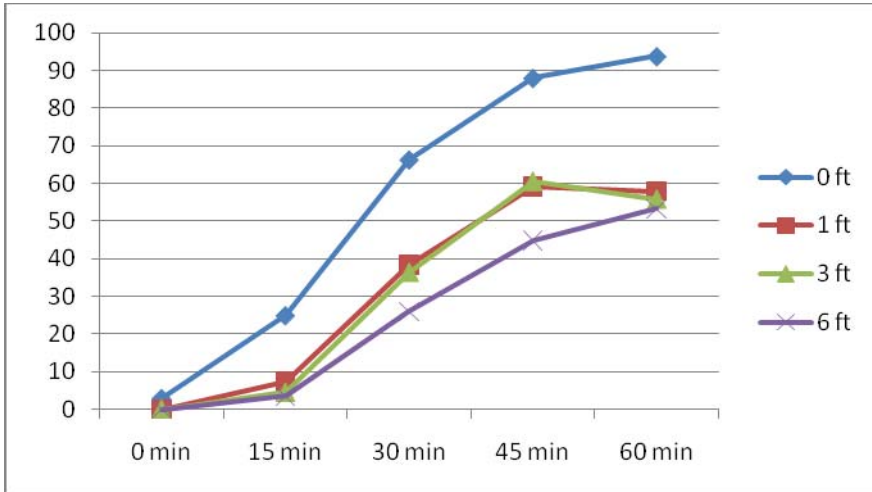


Oct. 25



Average (n = 30; 6 ant mounds at each time interval and distance averaged over 5 dates)





**Figure 2.** Mean of estimated foraging red imported fire ant workers associated with a hot dog slice food lure placed 0, 1, 3 and 6 ft from the ant mound center over time, , Pecan Genetics Lab, USDA, Hwy 50, Brazos Co., Texas, for July 16, Aug. 8, Sept. 18 and Nov. 8, 2007 (n = 8; 2 mounds per 4 sampling dates).

