DEVELOPMENT AND FIELD EVALUATION OF AN ELEVATED BAIT STATION FOR CONTROL OF DEER MICE IN ALMONDS

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Abstract: Deer mice (*Peromyscus* spp.) have been identified as a serious pest in almonds in portions of the San Joaquin Valley of California. Broadcast anticoagulant bait is normally used to control deer mice, but is prohibited in areas where the endangered giant kangaroo rat (*Dipodomys ingens*) occurs, leaving growers with no practical means of control. The objectives of this study were to design and test in the laboratory a disposable, spill-resistant, bait station for deer mice, and to field test the bait station in almond orchards.

We obtained 20 captive-bred deer mice and observed them interact with prototype bait stations in an observation chamber and in simulated almond trees in outdoor pens. Mouse activity was videotaped in the pens and food consumption measured. Field efficacy trials were conducted in July 2002 in 2 almond orchards, Meyers Block 3 and Cantua, both in Fresno County, California. We used an activity index based on sign left in the crotch of almond trees to estimate efficacy.

Mice entered and fed in the prototype bait stations in the observation chamber. Review of 315 hr of videotapes from the pens revealed that the mice readily climbed the almond tree stumps and entered the bait stations to feed. The mice were nocturnal and most active from about 2020 hr through 0530 hr, with virtually no activity during the daylight hours. Use of the bait stations averaged up to 39 entries/mouse/night. The average daily consumption of clean grain per mouse for males was 2.6 gm (SE = 0.39, range = 1.1 - 3.6 gm) and for females was 2.2 gm (SE = 0.26, range = 1.4 - 3.0 gm). Feeding behavior appeared normal and food consumption was not inhibited by the bait stations.

The field efficacy trial consisted of 1-week pretreatment period, 2 weeks of treatment with 0.005% diphacinone on oat groats, and a 1-week posttreatment period. Each study area included a treated area of ∃1150 trees and a control (nontreated) area of ∃435 trees. We deployed bait stations filled with 100 gm of bait or clean grain in a grid pattern of every 3^{rd} row and 3^{rd} tree within a row, 119 stations for treated plots and 47 or 48 stations on the control plots. Based on activity indices, efficacy was 72% at Meyers Block 3 and 33% at Cantua. Consumption of diphacinone bait on the treated plots averaged 0.6 and 3.2 gm/station for the 2-week treatment period, at Meyers 3 and Cantua, respectively. Consumption of clean grain on the control plots averaged 1.2 and 5.1 gm/station for the 2-week treatment period, or 0.08 and 0.36 gm/day, at Meyers 3 and Cantua, respectively. Consumption of clean grain did not approach levels recorded in our pen tests. These findings suggest poor bait acceptance. We speculate that almonds were preferred over oat groats, and that bait acceptance might improve if the grain bait was offered during the winter or early spring when the supply of almonds would be reduced.

Key words: almonds, bait station, deer mouse, *Peromyscus* spp.

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INTRODUCTION

Deer mice (*Peromyscus* spp.) are common throughout California (Ingles 1965). These small mice are usually associated with seed depredation in reforestation efforts (Clark 1994) or as nuisance pests around homes and other buildings. Recently, deer mice have been linked to the transmission of hantavirus, which is a serious and often fatal human respiratory disease (Fritz *et al.* 1998).

Deer mice have been identified as a pest in almonds in portions of the San Joaquin Valley (e.g., along the Interstate 5 corridor). Within the last several years, many almond growers have experienced serious damage (nut loss) from deer mice (F. Rinder, Fresno County Agriculture Commissioner, personal communication), especially along the Interstate 5 corridor where orchards abut rangelands. Deer mice are normally controlled by broadcast 0.01% chlorophacinone or diphacinone bait. Deer mice have excellent seed foraging capabilities and broadcast baiting can be effective. However, in many areas along Interstate 5, almonds are grown in the range of the endangered giant kangaroo rat (*Dipodomys ingens*). In these places, broadcast baiting is not allowed, leaving growers with no practical means to control deer mice. However, Whisson (1999) found that elevating a box-type bait station 30 cm off the ground was sufficient to deny access by kangaroo rats (*Dipodomys* spp.), yet still allowed entrance by the California ground squirrel (*Spermophilus beecheyi*). As deer mice are arboreal and feed on almonds in the crotch of the tree, Whisson's findings suggested a similar strategy of placing a bait station off the ground in an almond tree would target deer mice and protect kangaroo rats.

The objectives of this project were to design and test in the laboratory a disposable, spill-resistant elevated bait station suitable for deer mice, but not kangaroo rats, and to field test the bait station in almond orchards.

METHODS

Laboratory Studies

In April 2002 we obtained 10 male and 10 female *Peromyscus maniculatus sonoriensis* from a breeding center at the University of South Carolina. The mice were certified hantavirus-free. The ears of each mouse were uniquely clipped to allow identification. We housed the mice, with the sexes segregated, in 2 converted water troughs. The circular troughs were 0.6 m high and 1.2 m in diameter. The bottom of each trough was covered with wood shavings or Care Fresh bedding. The mice were provided with 3 or 4 mouse-sized den chambers/trough and were fed lab chow, oat groats, water, and a fresh vegetable. Each trough was covered with a wooden-framed wire mesh cover. One trough each was located in an 2.9 x 5.8 m outdoor pen with a roof overhead for shade.

Observation Chamber- We began observations by placing 2 mice at a time into a standard 10-gallon aquarium with a wire mesh cover. We initially laid a ½-liter clear plastic bottle on its side in the chamber with about 10 gm of clean oat groats inside. In subsequent tests we also placed grain in the bottle but attached: 1) the plastic bottle to a 30-cm section of almond limb and propped the bottle and limb on the side of the chamber at approximately a 60^0 angle, and 2) as in #1 above, but with the neck of the bottle removed and a 14 x 1.3 cm piece of wood lathe placed in the bottle to serve as a ramp for the mice. Original dimensions of the plastic bottle were 205 mm length with the opening diameter of 22 mm. When the neck was removed, length ranged from about 175 to 180 mm, with the opening ranging from about 36.5 to 38.5 mm.

We observed the mice for 60 min and recorded the time of 1st entry of the plastic bottle for each animal, the number of entries, and the length of time each mouse remained inside the bottle.

Pen Observations - We obtained 10 almond tree "stumps" from an orchard near Arbuckle, Colusa County, California. The stumps included that portion of the trunk from about 15 cm above the ground up to and including the crotch of the tree and the 1st 0.3 to 0.6 m of the main scaffolds (limbs). The stumps were intended to simulate almond trees and to serve as the test bed for the elevated bait station. We randomly selected 4 stumps and stood 2 in each outdoor pen.

We set up a video monitoring system (Sentinel Video Surveillance System manufactured by Sandpiper Industries, Manteca, CA) to record deer mouse activity. The system had 4 infrared video cameras wired directly to a Panasonic time-lapse VCR and was powered by a 12-volt deep-cycle marine battery. The VCR recorded continuous video (30 frames/s) onto a 24-hr VHS tape. Two cameras were set up in each pen, aimed at the crotch of each stump. The cameras were placed at a height of about 0.6 m above ground and 0.6 m from the stump. One wide-mouth version of the plastic bottle (hereafter called bait station) was placed in the crotch of each stump and affixed in position with duct tape and a nail. The average height of the bait stations in the crotch of the trees above the pen floors was 44.8 cm ± 4.6 SD.

We introduced a pair of mice at a time into each pen for periods ranging from 3 to 7 days. Eight pairs of mice (4 female and 4 male) were tested. During tests we ran the VCR continuously, stopping only to change the tape or battery. For tests with pairs of mice, the bait stations contained 25 gm of clean oat groats. We measured consumption on a regular basis and replenished the oats as needed. After testing the 8 pairs of mice, we introduced all of the mice into the pens (9 females in 1 pen and 7 males in the other pen). We provided 100 gm of oat groats in each bait station and recorded consumption as before. We provided water and a nest chamber in the pens for the mice.

The video monitoring system produced a 4-panel split screen video. We viewed at least a 24-hr period of the videotape for each pair or group of mice. We recorded the number of entries into each bait station and the start and end of the activity period for that given day.

Field Study

We selected 2 almond orchards in Fresno County, California, for a field trial to determine the efficacy of baiting with the elevated bait stations. The 1st orchard, Meyers 3, was a 29-ha orchard located west of Interstate 5 in the northern portion of the county. The 2nd study site was called Cantua, a 32-ha orchard near the town of Cantua Creek.

In late April and early May 2002 we conducted preliminary surveys to assess deer mouse presence in the orchards. We used an index based on feeding activity (sign). Deer mice commonly climb up the trees, clip off a nut, and return to the crotch of the tree to feed. Feeding in the crotch typically results in an accumulation of shavings from the husk and shell; sometimes empty shells are also present. During the preliminary surveys we walked along 4 partial rows (n = 113 trees) at Meyers 3 and 2 rows of trees (n = 141 trees) at Cantua. We observed old or fresh sign at 83% and 97% of the trees at Meyers 3 and Cantua, respectively, indicating widespread presence of deer mice.

We divided each orchard into a treatment block and a control (nontreated) block located at opposite sides of each orchard. The blocks were separated by ∃18 rows of trees at Meyers 3 and by 90 rows at Cantua. At each orchard the treated block consisted of 16 rows of trees while the control block had 6 rows (Table 1).

Table 1. Tree spacing and number of trees by variety of the treatment and control blocks of 2 study orchards in Fresno County, California, 2002.

			Treatment		Control	
Orchard	Tree spacing[a] (m)	Variety	Rows	Trees	Rows	Trees
Meyers 3	6.7 X 5.5	Nonpareil	8	600	3	221
		Carmel	8	599	3	221
Cantua	7.3 X 5.5	Nonpareil	8	577	3	218
		Monterey	4	285	2	145
		Carmel	4	288	1	72

[a]Distance between rows X within rows.

In early July 2002 we began the efficacy trial by marking all trees in the control and treatment blocks of both orchards if sign (old or new) was present in the crotch of the trees. We marked the sign by covering it with a water-soluble, yellow spray paint (Table 2). One week later we returned and re-marked any new sign with red spray paint. The percentage of trees with fresh sign represented the pretreatment activity index.

Table 2. Timing of events at Meyers 3 and Cantua Creek orchards in Fresno County, July 2002.

Orchard	Marked all sign	Marked new sign, bait stations deployed	Marked new sign, bait stations removed	Recorded new sign
Meyers 3	1 July	8 July	22 July	29 July
Cantua	2 July	9 July	23 July	29 July

We then deployed the wide-mouth bait stations filled with 100 gm of 0.005% diphacinone grain bait obtained from the Yolo County Agricultural Commissioner. The bait stations were labeled with warnings in English and Spanish. We placed the bait stations in a grid pattern, with stations in every 3^{rd} row (starting on row 2) on every 3^{rd} tree (starting on 2^{nd} tree from the start of the row). This pattern resulted in every tree being no farther than 1 row or 1 tree away from a bait station. We placed a bait station in the crotch of each selected tree and secured it to the tree with a duct tape tab and a staple hammer. We deployed bait stations filled with 100 gm of clean oat groats in the control plots using the same grid pattern. All bait stations had a 14 x 1.3 cm piece of wood lathe inside. We removed the bait stations 2 weeks later.

When the stations were removed we checked all the trees for fresh sign and marked it with blue spray paint (Table 2). One week later we returned and checked all trees for fresh sign. The percentage of trees with fresh sign deposited during the previous week represented the posttreatment activity index.

We used the activity index to calculate efficacy (reduction in activity) as follows:

[(pretreatment activity index - posttreatment activity index)/pretreatment activity index] X 100%

If the posttreatment activity index on the associated control plot decreased from the pretreatment level, then the percentage decrease was directly subtracted from the calculation above.

Upon return to the laboratory we measured consumption of bait or grain from each bait station as a 2nd measure related to efficacy.

RESULTS

Laboratory Studies

Observation Chamber - We observed mice during 12 test sessions. Four mice were tested more than once. Four mice that did not enter the bait station and 2 additional mice paired in the same test session were excluded from data analyses (Table 3). The latter 2 mice were excluded because 1 mouse couldn't exit the bait station (see below) and may have prevented the 2nd mouse from entering. The 1st series of observations with the bait station placed horizontally verified that the mice could enter through the narrow mouth. The 2nd set of observations with the container placed on a log leaning at about a 60^0 angle from horizontal indicated that the mice would readily climb up and down the almond log and enter the station. Some mice had difficulty exiting through the narrow mouth of the bait station. One mouse, #91, entered the station and was not able to exit despite repeated attempts. The 3rd setup rectified this problem by removing the narrow mouth and neck and placing a stick in the bait station. The modifications were successful with the mice climbing up and down the stick with no further difficulties in entry or exit. In the 3rd series the average time to 1st entry was inflated by mouse #91, which did not enter until nearly 52 min into the 60 min session. This was the same mouse in a previous test that couldn't exit, which perhaps resulted in a subsequent avoidance behavior.

Pen Observations.- - We reviewed 235 hours of video tape of 8 different pairs of mice and 69 hours of all the mice released in 2 groups. The mice were nocturnal, with activity occurring after 2015 hr and ending by 0530 hr (Table 4). Almost no activity was observed during the daylight hours when the mice had retired to the nest chamber. The mice readily climbed up and down the almond stumps and entered the bait stations to feed. The pairs of mice averaged 57.6 entries/night ± 14.7 SD with a range from 42 to 87 entries during the evening activity period. This is equivalent to 28.8 entries/mouse. The mice in groups averaged 315.5 entries/night ± 61.5 SD with a range from 272 to 359 entries during the evening activity period. On an individual basis, the mice in the groups entered the bait stations more frequently than the paired mice, at 39.4 entries/mouse.

Table 3. Results from observations of deer mice in a chamber with a bait station filled with 10 gm of clean oat groats including: average number of entries/mouse (for mice that entered the station), average time from start of test to 1^{st} entry/mouse (min and sec), range of times to 1^{st} entry, average time spent in the station/mouse, and range of time (min and sec) spent in the bait station.

Bait station setup	No. of mice	0 no. of entries (±SD)	0 time to 1^{st} entry (±SD)	Range of times to 1^{st} entry	0 stay in bait station (±SD)	Range of times spent in bait station
horizontal, small mouth	5	6.4 (1.5)	11' 20" (6' 32")	3' 9" - 21' 12"	1' 33" (3' 1")	1" - 13' 17"
60^0 angle, small mouth	7	7.4 (5.5)	5' 39" (1' 54")	2' 23" - 8' 25"	1' 4" (2' 30")	2" - 12' 53"
60^0 angle, wide mouth with stick	6	4.2 (2.3)	14' 25" (18' 21")	5' 4" - 51' 49"	23" (40")	4" - 3' 16"

Table 4. Activity periods and number of entries from bait stations by deer mice in outdoor pens.

Group no.	No. of mice	Sex	Date	Time period (hr)	Start - end of entries (hr)	No. of entries
1	2	male	22 May	1630-2000	1701-1742	2
			22-23 May	2000-0600	2024-0534	68
			23 May	0600-2000	-	0
			24 May	1200-2000	-	0
			24-25 May	2000-0600	2053-0532	66
2	2	female	22 May	1630-2000	1641-1709	6
			22-23 May	2000-0600	2021-0535	46
			23 May	0600-2000	-	0
			24 May	1200-2000	-	0
			24-25 May	2000-0600	2028-0533	75
3	2	male	28 May	1000-2000	-	0
			28-29 May	2000-0600	2109-0544	59
			29 May	0600-1000	-	0
4	2	female	28 May	1000-2000	1016-1018	3
			28-29 May	2000-0600	2017-0534	42
			29 May	0600-1000	-	0
5	2	male	4 June	1000-2000	1018-1838	6
			4-5 June	2000-0600	2023-0528	48
			5 June	0600-1000	-	0
6	2	female	4 June	1000-2000	1034-1940	5
			4-5 June	2000-0600	2028-0532	50
			5 June	0600-1000	-	0
7	2	male	10 June	1000-2000	-	0
			10-11 June	2000-0600	2049-0515	87
			11 June	0600-1000	-	0
8	2	female	10 June	1000-2000	-	0
			10-11 June	2000-0600	2040-0521	61
			11 June	0600-1000	-	0
9	7	male	11 June	1517-2000	-	0
			11-12 June	2000-0600	2029-0533	272
			12 June	0600-2000	0604	1
			12-13 June	2000-0200	2026-0200	221
10	9	female	11 June	1517-2000	1629-1742	2
			11-12 June	2000-0600	2021-0540	359
			12 June	0600-2000	0613	1
			12-13 June	2000-0200	2024-0200	269

Daily consumption of clean grain by males ranged from 1.1 to 3.6 gm/mouse and for females ranged from 2.1 to 3.0 gm/mouse (Table 5). There was no difference in consumption of males (0 = 2.6 gm/day ± 0.4 SE) versus females (0 = 2.5 gm/day ± 0.2 SE). Overall the mice consumed an average of 2.55 gm/day ± 0.2 SE of oat groats. We did not observe any neophobic reaction by mice to the bait stations. The mice entered and fed from the stations starting with the 1st night of exposure. We observed no caching of grain in the nest chambers or elsewhere in the pens.

Table 5. Consumption of clean oat groats from elevated bait stations positioned on almond tree stumps in outdoor pens, May - June 2002.

Group number	Number of Mice	Sex	Test dates	Number of days	∑ grain consumed (gm)	Grain consumed per mouse (gm)	Grain consumed per mouse per day (gm)
1	2	male	22 - 28 May	6	22.2	11.1	1.8
2	2	female	22 - 28 May	6	24.7	12.4	2.1
3	2	male	28 May - 4 June	7	44.8	22.4	3.2
4	2	female	28 May - 4 June	7	41.9	21.0	3.0
5	2	male	4 - 7 June	3	6.8	3.4	1.1
6	2	male	7 - 11 June	4	20.5	10.2	2.6
7	2[a]	female	7 - 11 June	4	10.8	10.8	2.7
8	7	male	11- 17 June	6	138.7	20.0	3.3
9	9	female	11 - 17 June	6	129.1	14.3	2.4
10	7	male	17 - 25 June	8	200	28.6	3.6
11	9	female	17 - 25 June	8	167	18.6	2.3

[a]One female missing and presumed escaped from the pen on the 1st day of the trial. Consumption data thus result from 1 mouse.

Field Study

We examined 442 and 435 trees in the control plots and 1199 and 1152 trees in the treatment plots at Meyers 3 and Cantua, respectively, for deer mouse sign (Table 6). Upon the initial examination, we found sign at 81% and 95% of the trees in the treatment and control plots at Meyers 3, respectively. At Cantua ∃92% of the trees on both plots had sign. The old and fresh sign recorded on the initial examination represented deer mouse activity that could have occurred up to several months earlier, possibly back to the previous almond harvest in August or September 2001. Upon the 2nd examination, we found 22% and 26% of the trees on the treatment and control plots at Meyers 3 had fresh sign, respectively. At Cantua the corresponding figures were 49% and 44% on the treatment and control plots, respectively. These percentages represented the pretreatment activity indices for a 1-

week period prior to treatment.

Table 6. Percentage of almond trees with deer mouse sign at 2 study orchards in Fresno County, California, July 2002.

Orchard	Plot[a]	No. of trees	Percent of trees with sign				
			1 July[b]	2 July[b]	8 July[c]	9 July[c]	29 July[d]
Meyers 3	Control	442	94.6	-	26.2	-	24.4
	Treated	1199	80.6	-	22.4	-	5.8
Cantua	Control	435	-	92.0	-	44.3	32.9
	Treated	1152	-	93.2	-	48.7	27.0

[a]Bait stations on control plots filled with clean oat groats. Bait stations on treated plots filled with 0.005% diphacinone on oat groats.

[b]Old and fresh sign recorded on these dates represents deer mouse activity that could have occurred up to several months earlier, possibly back to the previous almond harvest in August or September 2001.

[c]Fresh sign recorded on these dates represents deer mouse activity during the 1-week pretreatment period prior to the deployment of the bait stations.

[d]Fresh sign recorded on 29 July represents deer mouse activity during the 7-day period of 22 - 29 July at Meyers Block 3 and the 6-day period of 23 - 29 July at Cantua Creek. These 2 time periods began with the removal of the bait stations and represent the posttreatment period.

We deployed 119 bait stations on the treatment plots of Meyers 3 and Cantua at the end of the pretreatment period. There were 48 and 47 bait stations with clean grain deployed on the control plots at Meyers 3 and Cantua, respectively.

We marked all new sign on the day the bait stations were removed. One week after the bait stations had been removed we found 6% and 24% of the trees at Meyers 3 had fresh sign, in the treatment and control plots, respectively. The corresponding figures at Cantua were 27% on the treatment plot and 33% on the control plot. These data represent the posttreatment activity indices for the 1-week period after treatment ended.

There were decreases in the activity indices from pre- to posttreatment on the control plots at both sites. Thus, we adjusted the efficacy calculations by -1.8% for Meyers 3 and -11.4% at Cantua. Based on the activity indices, efficacy was 72.3% at Meyers 3 and 33.2% at Cantua.

Consumption of clean grain on the control plots averaged 1.2 ± 1.4 SD and 5.1 ± 4.0 SD gm/station for the 2-week treatment period at Meyers 3 and Cantua, respectively (Table 7). Consumption of diphacinone bait on the treated plots averaged 0.6 ± 0.4 SD and 3.2 ± 5.9 SD gm/station for the 2-week treatment period at Meyers 3 and Cantua, respectively. Consumption from stations on the control plots ranged from 0 - 7.9 gm and 0.6 - 14.5 gm at Meyers 3 and Cantua, respectively. Consumption on the treatment plots ranged from 0 - 2.7 gm and 0 - 37.6 gm at Meyers 3 and Cantua, respectively. At Meyers 3 107 of 119 bait stations (90%) with toxic grain had #1 gm of bait consumed and at Cantua 65 of 119 bait stations (55%) had #1 gm consumed.

Table 7. Average amount (gm ± 1 SD) of toxic grain (0.005% diphacinone) and clean oat groats consumed per bait station at the Meyers Block 3 orchard from 8 - 22 July 2002 and

at the Cantua Creek orchard from 9 - 23 July; the number of bait stations per row and the number of bait stations with #1 gm of bait consumed during the treatment period.

Orchard	Treated plot row number						Control plot row number		
	2	5	8	11	14	All rows	2	5	All rows
Meyers 3									
0 ± SD	0.8 ± 0.2	0.5 ± 0.1	0.3 ± 0.2	0.8 ± 0.5	0.6 ± 0.5	0.6 ± 0.4	1.6 ± 1.6	0.9 ± 1.0	1.2 ± 1.4
No. of bait stations	24	24	23	24	24	119	23	24	47
No. with # 1 gm consumed	19	24	23	19	22	107	12	15	27
Cantua									
0 ± SD	0.8 ± 1.3	1.0 ± 1.0	5.1 ± 7.1	2.9 ± 3.4	6.4 ± 9.3	3.2 ± 5.9	5.2 ± 4.4	4.8 ± 3.8	5.1 ± 4.0
No. of bait stations	23	24	24	24	24	119	24	24	48
No. with # 1 gm consumed	19	17	9	10	10	65	4	2	6

DISCUSSION

Laboratory Studies

The laboratory studies verified that the basic design of the bait station was acceptable. The dimensions of the bait station, after some minor modifications, were sufficient to permit entry, exit, and feeding within. The lab studies also supported the concept of placing a bait station off the ground in the crotch of a tree. The mice readily climbed the simulated almond trees, entered the bait stations, and fed on the grain. It appeared there was nothing about the bait station design or it's placement that inhibited normal behavior, in particular food consumption. Our recorded daily food consumption of 2.55 gm/mouse essentially matched the consumption of 2.5 gm/ mouse recorded at the National Wildlife Research Center in a toxicity study with captive deer mice (McCann 1999). The results from the laboratory study provided the justification for starting the field study.

Field Study

The reduction in the activity indices of 72% at Meyers 3 and 33% at Cantua were not satisfactory. Consumption for both the toxic bait and clean grain were very low. Consumption of the clean grain on the control plots did not approach levels recorded in either our pen tests or at NWRC. In addition, if one conservatively estimated that a 1% change in the original 100 gm of bait could be due to moisture loss, then it is possible that mice didn't consume any bait at the majority of bait stations on both treatment plots.

Based on the lab studies and the presence of sign in the trees (sometimes next to a bait station), there is no reason to think that the mice avoided the stations or did not come into contact with them. The findings strongly suggest poor bait acceptance. We speculate that in the orchards, where choices of food were available, almonds were preferred over oat groats. Summer, when almonds are abundant in the orchard, may not be the best time for treatment because of poor bait acceptance. Bait acceptance might improve if the grain bait is offered during the winter or early spring when the availability of almonds would be much reduced.

Future Research

Additional research is warranted. An efficacy trial in the winter or early spring when almonds are in low supply may result in improved bait acceptance. A test for bait acceptance should be incorporated into the study design and a commercially available bait station should be used.

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