Impact of field-border management on rodents and foodborne pathogens in walnuts

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Conventional, weedy field-border (control)

House mouse with ear tag

Measuring vertical cover throughout the orchard

Native shrub and grass field-border (hedgerow)

Background

- Rodents and other small mammals can cause serious crop losses, tree girdling, burrowing, and chewing on drip irrigation lines
- The impact of field border management on rodent activity in adjacent crops is not well known.
- Little is known about rodent pathogen prevalence in many crops

Questions

- Do hedgerows increase rodent activity in adjacent crops?
- What is the pathogen prevalence in rodents?

The Study

Rodent Trapping

- 4 walnut orchard sites in Yolo County with a hedgerow and a control field-border
- 20 traps in 2 linear transects within the hedgerow or control field-border and at 33, 246, and 574 feet distances into the orchard
- Individual mice and voles were captured, ear tagged, fecal samples collected, and then released

Small Mammal Camera/Video Surveillance

- 3-4 cameras set in each transect baited with wax blocks to measure small mammal activity throughout the orchard
- 4 video cameras to capture wildlife coming and going from field-border transects

Gopher Mound Counts

- 1 transect set at each distance (field-border and 33, 246, and 574 feet into orchard)
- Within transects, I leveled old mounds and counted new mounds 3 days later

Traps and cameras set each season for one year (2013-2014) for 5 days per site

Deer mouse with trap in the background

RESULTS

Biodiversity

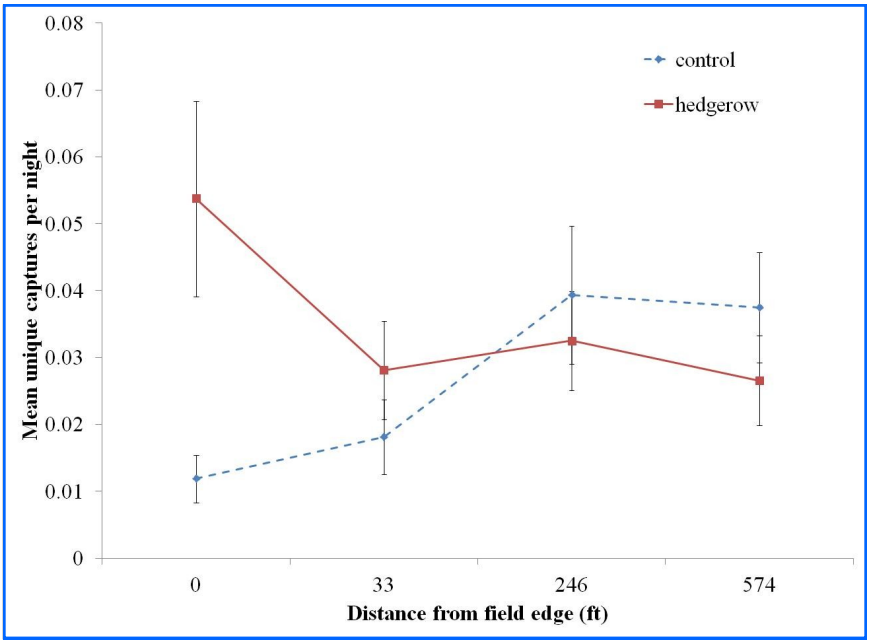
Number of individual mice and voles trapped and number of cameras reporting other wildlife in hedgerow and control portions of sites by season.

Species[a]	Hedgerow				Control			
	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring
Deer mouse	43	18	97	45	48	24	81	17
House mouse	0	6	7	0	0	0	0	0
California vole	0	1	4	1	0	0	1	0
Western harvest mouse	0	0	0	2	0	0	0	0
California ground squirrel	6	1	0	0	1	0	0	0
Western gray squirrel	1	0	0	0	0	0	0	0
Black-tailed jackrabbit	2	7	18	8	0	10	6	1
Desert cottontail	13	7	1	0	0	0	0	0
Mule deer	4	0	0	1	3	0	0	0
Raccoon	7	2	1	0	5	4	1	0
Virginia opossum	6	5	4	0	2	0	0	0
Striped skunk	3	1	2	0	3	0	1	1
Domestic cat	25	4	9	7	25	10	17	4
Domestic dog	2	0	0	1	1	0	1	0
Total species active	11	10	9	7	8	4	7	4

- There were more mouse species found in or near the hedgerow than the rest of the orchard
- Cottontails were only found on the hedgerow side of the orchard
- Jackrabbits and opossums were found much more frequently on the hedgerow side with most other species found nearly equally throughout the field
- Few mammal species are using these linear habitat areas year-round

Rodent Activity Distribution

Mean (± SE) number of individual rodents captured per trap night at set distance intervals (m) from hedgerow and control field edges.



- Deer mice were found throughout the orchard regardless of field edge management, however all other mouse and vole species were observed primarily in the hedgerow
- Hedgerow field-borders are more attractive to rodents than orchard interiors
- Control field-borders were less attractive than orchard interiors
- Deer mice were most active during the winter while all other seasons showed similarly low rates of activity throughout the orchard
- Gophers preferred the open areas immediately adjacent to hedgerows rather than the thick understory of hedgerow interiors

Food-borne Pathogen Prevalence

0% (0/353 samples) rodents infected with O-157 E. coli
0.8% (3/353 samples) rodents with Salmonella, found in species that prefer hedgerows over orchards

- 0% of rodents were infected pre-harvest
- Rodents are rapid digesters so bacteria do not have long before they are exposed to the outside elements resulting in die off.