

PROJECT REPORT:

Project Title: Food Safety and Rodent Control in Leafy Green Crops

Research Agency: University of California

Principal Investigator: Terrell P. Salmon

Budget: \$87,983.00

Background:

The overall goal of this project was to develop a systematic approach for monitoring and controlling rodents in and around leafy green crops.

The safety of the food supply is a primary consideration of farmers, wholesale and retail establishments, and ultimately consumers. While past food safety efforts related to rodents and rodent control have primarily focused at the food processing level, recent food safety outbreaks have attracted more attention to farm production activities. Since 1995 there have been 20 outbreaks of food borne illness in the U.S. from *Escherichia coli* O157:H7 on leafy greens such as spinach. In 2006, a major outbreak of food borne illness caused by *Escherichia coli* O157:H7 contaminated bagged spinach resulted in 3 deaths and over 200 illnesses. The contaminated product was traced to bagged leafy green spinach from central California.

As a result, in 2007, produce industry representatives, with oversight from the California Department of Food and Agriculture (CDFA), developed the Commodity Specific Food Safety Guidelines for the Lettuce and Leafy Greens Supply Chain, known as the Metrics. The guidelines focus on the entire production operation from farm to packaging and distribution with the goal of minimizing microbial contamination. One issue specifically addressed in the guidelines is encroachment by animals (e.g. livestock, deer, wild pigs). Growers are advised to determine whether or not to harvest portions of a field with signs of wildlife pest activity (e.g. damaged crop, wildlife feces). In addition, buyers and shippers can and do impose additional requirements on growers as a condition of buying their crop.

Rodents are not mentioned as species of concern in the Metrics nor has research established a strong link between rodents and contamination of leafy green crops in the field. Until the actual link, or lack thereof, is identified growers, shippers/buyers and others are treating rodents as suspects in the food borne illness complex. Growers, in some cases, have been told by buyers to eliminate rodents without any proof that rodents are actually present.

The project focused on a better understanding of the relationship between rodents and leafy green crops in California.

Objectives:

1. Identify the current issues and requirements that growers must address regarding rodent encroachment in leafy green crops.
2. Identify the current situation regarding rodents in and around leafy green crops.
3. Develop monitoring strategies to address rodents in and around leafy green crops.
4. Develop training materials on managing rodents in and around leafy green crops for growers and others dealing with food safety issues.

Summary and Report:

In 2006 spinach contaminated with *Escherichia coli* resulted in the death of 3 people and over 200 illnesses. The contaminated spinach was traced to a field in California. In 2007 produce industry representatives developed safety guidelines (known as the Metrics) for lettuce and other leafy green crops. The Metrics addressed encroachment and crop contamination by wildlife and livestock. Although not specifically mentioned in the Metrics, rodents are treated by growers and buyers as suspects in the food-borne illness complex. This has resulted in many unnecessary, ineffective, and expensive rodent control practices in leafy green crops. The Metrics require periodic monitoring of animal activity in and around the crop fields, but there are no specific guidelines on how to monitor for rodents. Specific objectives for this project were to: 1) identify the issues and requirements growers must address, particularly those demanded by buyers of leafy green crops, regarding rodent encroachment in leafy green crops; 2) identify the rodent species that live in and around leafy green crops; 3) develop monitoring strategies for rodents; 4) develop training materials on monitoring rodents.

We contacted major buyers of leafy green crops to obtain information on what they require from growers regarding rodent control. The information provided was varied. However, assessment of rodents in leafy green crops is clearly a priority

for buyers with many producing written guidelines for growers. Visual monitoring and traps were the most consistent response.

We conducted fieldwork in the Salinas Valley region of Monterey County from May 2009 through June 2010. We surveyed 10 iceberg lettuce and 4 spinach fields to identify the rodents present and test rodent monitoring techniques. We surveyed each field during a period 7 to 14 days before harvest and again 1 to 6 days prior to harvest. We checked wax blocks, wax tags, and snap traps over a 3-day period along transects set up along the crop edge and the adjacent wild edge (wild vegetated area alongside the crop, often separated by a road). We also conducted visual surveys from a vehicle and on foot. We calculated an index of abundance (IA) to provide a measure of relative abundance. We combined control strategies from the California Vertebrate Pest Control Handbook (2008) with the results of the monitoring programs to produce a pocket manual specific to rodent monitoring in and around leafy green crops.

Visual surveys indicated no California ground squirrels (*Spermophilus beecheyi*) on any site, but pocket gophers (*Thomomys* spp.) were present on 11 of 14 sites along the wild edge adjacent to the crop, but in-crop at only 2 of 14 fields. We observed small rodent burrows and runways along the wild edge, but never in crop. For all fields we trapped 17 mice in-crop and 51 mice along the wild edge.

Deer mice and brush mice (*Peromyscus* spp.) were most commonly caught (15 in-crop and 33 along the wild edge), with house mice (*Mus musculus*) the next most abundant (2 caught in-crop and 15 along the wild edge). Wax blocks had the greatest amount of chewing activity both in-crop and along the wild edge at 10.2% and 36.3%, respectively. Wax tags were less preferred, showing activity 4 levels of 1.1% in-crop and 6.6% along the wild edge. The catch levels for snap traps at 1.7% in-crop and 5.4% along the wild edge were similar to the chewing activity for wax tags. In 15 of 27 (56%) surveys in-crop and in 28 of 28 (100%)

surveys along the wild edge, the wax blocks had higher IA values compared to the wax tags or snap traps. In most cases the IA values decreased, stayed the same, or increased only slightly from the 1st to the 2nd survey. Wax blocks and to a lesser degree, wax tags, were subject to feeding by snails, but that feeding could be differentiated from feeding by rodents. Wax tags melted at temperatures >800F. To monitor rodents in leafy green crops, we recommend visual surveys for ground squirrels and gophers, and snap traps and wax blocks for mice. We suggest 1 survey conducted 2 to 3 weeks prior to harvest is sufficient to assess mouse presence and relative abundance in leafy green crops. We provide guidelines on how to conduct the surveys, a sample datasheet, and examples of IA calculations.

We reviewed the Metrics and identified all portions related to rodents and rodent control. Monitoring techniques were evaluated for their practicality and ability to detect rodents. Control strategies from the California Vertebrate Pest Control Handbook (2008) were combined with the results of the monitoring program to create a field guide containing relevant monitoring and control information regarding rodents and leafy green production. This booklet consists of 15 pages front and back containing picture references and a list of helpful website links.

Last Updated:

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