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RODENT PROBLEMS RELATIVE TO MECHANICAL HARVESTING

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ABSTRACT: As the number of crops that are mechanically harvested increases, the reports of rodent problems associated with those crops increase also. This report examines the rodent problems in mechanically harvested tomatoes and reports on work done in studying the effects of various border crops on rodent populations. It also looks at possible rodent management options available to growers of mechanically harvested crops.

MECHANICAL HARVESTING, THE HISTORY

Mechanical harvesting of crops such as wheat and barley has been with us since the late 1800s (Martin et al. 1967). In the 1960s vegetables destined for the processor were being harvested mechanically, a result primarily of the increasing labor costs (VandeVanter 1982).

It is with the mechanically harvested vegetables that a problem with rodents was discovered. Vegetables that reached the processor were contaminated by rodents or rodent parts. A survey of the food-processing industry conducted in 1981 indicates that at least six crops are plagued with rodent contamination when mechanically harvested (Table 1). Reports also show that the problem exists in at least nine states (Table 1). In addition, California wine-grape growers in the Central Coast region report problems with rodent contamination when grapes are harvested mechanically. The problem is often compounded when some growers field-crush their grapes (Hampton 1981).

Table 1. Results of 1981 survey by the National Food Processors' Association concerning rodents in mechanically harvested vegetables (Cooper 1982).

Crops Involved	Geographic Locations
Lima beans	Illinois, Wisconsin
Snap beans	Idaho, Illinois, Minnesota, New York, Utah, Wisconsin
Table beets	Texas, New York
Peas	Illinois, Minnesota, New York, Washington, Wisconsin
Spinach	California, Texas
Tomatoes, processing	California

As the use of mechanical harvesting expands and as more sophisticated sorting systems are developed, there will be more problems of rodent contamination. As fewer people are involved in the picking and sorting process, the potential increases for rodent-contaminated produce reaching the processors. These rodent contamination problems point toward a need for pest control advisors and growers to more carefully monitor field rodent populations and to implement sound rodent management programs when necessary.

EXAMPLE: PROCESSING TOMATOES

During the 1979 growing seasons, a number of processors and growers experienced serious field rodent problems in processing tomatoes. One processor representative indicated his company experienced losses in excess of $125,000.00 of finished product. This does not reflect the tomatoes that were dumped prior to entering the processing plant. The rodents that were most often found as a contaminant were meadow mice (*Microtus* sp.).

During the 1980 and 1981 seasons, efforts have been made to take a closer look at the problem, to attempt to develop monitoring tools and to begin to outline sound field rodent management guidelines growers can follow to minimize the potential of contamination.

The 1980 season was used to take a close look at cultural practices used by tomato growers that might relate to rodent populations. Many man-hours were spent riding tomato harvesters, standing at grading station inspection areas, or watching tomatoes off-loaded at a number of processing plants. After this effort, several preliminary conclusions were drawn: (1) with the present harvesting equipment, there is little chance of reducing the number of mice that contaminate a load of tomatoes; (2) use of toxicants in the field just prior to harvest should be avoided because potential of contamination would probably increase (live mice may be able to avoid being picked up); (3) the problem rodents include *Microtus*, *Peromyscus*, and *Mus*; and (4) cultural controls and winter-baiting may be the most practical management options available.

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During the 1981 season, an effort was made to attempt to identify problem fields before harvest and to compare the effect of various border crops on rodent activity in tomato fields. The summer-long study was conducted by two trappers working five or six days a week.

METHODS AND MATERIALS

Sampling was done near the borders in tomato fields that were two to four weeks from harvest. At this time the canopy of the vine was sufficient to provide suitable cover for field rodents. Five mouse-size sticky board traps were placed along each edge of the tomato fields sampled. Runways were difficult to find in tomato fields so traps were placed on the beds under vine canopy four to five rows in from the field edge. A mixture of Quaker Oats and peanut butter was used as an attractant to draw the mice to the traps.

Traps were placed and marked with survey flags in the mornings and were collected approximately 48 hours later. Over 4,400 traps were placed in tomato fields throughout the California Central Valley between Fresno and Woodland.

If time allowed, fields which had significant activity (more than three mice trapped in five border traps) were surveyed a second time prior to harvest. During the second trapping period, in addition to the perimeter traps, a series of five traps was placed across the tomato field on a diagonal to measure the extent of the infestation within the field.

Trapping was initiated in mid-June on the west side of Fresno County and was completed in mid-September in the Woodland area. Records were maintained that involved dates of trapping, county, border crops, type of irrigation and specific field location.

RESULTS AND DISCUSSION

Processor reports indicate that the 1981 season was a year of few rodent contamination problems. Only 501 rodents were trapped in the 4,445 traps placed. The genus most often caught was Peromyscus followed by Mus and finally Microtus (Table 2).

Table 2. Collective results of border trapping of tomato fields sampled throughout the Central Valley of California (summer 1981). Each sample was comprised of side of a tomato field, with five sticky-board traps equally spaced. Traps were left in place for 48 hours.

Number of samples	Number of mice Microtus	Peromyscus	Mus	Total
889	14	360	127	501

The trapping method using the sticky-board traps appears to have given a relative index of the nature and extent of the rodent populations in the field. In comparing it with the standard snap trap, it was found to catch rodents whenever a rodent was caught in a neighboring snap trap, and often multiple catches were recorded with the sticky board. With the multiple-catches capability, the sticky-board trap may provide better information on relative rodent populations during peak years. The sticky-board traps baited with peanut butter and oatmeal are a useful tool for growers and fieldmen to monitor noncrop and crop areas for rodents.

As for border crop effects, the nature of the data collected makes analysis difficult. Statistical analysis of the data did indicate that there was an effect due to border-crop association, with crops like melons and cotton having the highest trapping incidence while areas like pastures and riparian habitat had low trap counts. Table 3 shows the various border crops and number of rodents trapped in the associated tomato fields.

Table 4 shows the results by county. Counties of Solano, Colusa and Fresno had relatively high rodent catches while counties of Contra Costa, San Joaquin and Sutter had low rodent catch figures. The differences in rodent catches by county was not analyzed statistically for several reasons. One, the counties in the northern portion of the valley were not sampled until later during the season, thus allowing for a potential build-up in the rodent populations. Second, the typical border crop varies as one moves north and this could affect trap results. Finally, the growers in the southern area of the study typically had much cleaner fields and border areas while those in the north had the influence of weedy ditches, woodlot, nontill orchards.

For those fields that were surveyed a second time, the results of the traps across the field indicated that by the time the tomatoes are ready for harvest the rodents have populated the entire field. No attempt was made to determine when the rodents moved into a field or how long it took them to colonize the entire field.

Table 3. Number of tomato fields sampled associated with kind and number of rodents caught in those samples (summer 1981). Each sample was comprised of five baited sticky traps placed for 48 hours.

Border crop	Number of samples	Number of Mice				Mice sample
		Microtus	Peromyscus	Mus	Total	
Melons	6	0	5	3	8	1.3
Highway	9	0	10	0	10	1.1
Cotton	110	1	77	6	84	.76
Grain	46	0	20	13	33	.72
Tomatoes	133	3	75	14	93	.7
Corn	24	0	12	4	16	.67
Weedy ditch/ Sugar beets	18	0	9	3	12	.66
Fallow field	57	2	24	13	38	.66
Non-till orchard	10	0	5	1	6	.6
Beans	10	0	6	0	5	.6
Weedy ditch	167	4	49	40	93	.56
Sudan	4	0	2	0	2	.5
Alfalfa	42	0	17	3	20	.48
Weedy ditch/ Tomatoes	62	1	11	16	28	.45
Sugar beets	29	0	7	3	10	.34
Weedy ditch/ Corn	27	2	5	1	8	.30
Weedy ditch/ Alfalfa	40	1	5	3	9	.22
Pasture	4	0	0	0	0	0
Riparian	8	0	0	0	0	0

Table 4. Rodent catches in tomato crops listed by counties (summer 1981). Each sample was comprised of five baited sticky traps placed for 48 hours.

County	Number of samples	Number of Mice				Mice sample
		Microtus	Peromyscus	Mus	Total	
Alameda	12	0	5	1	6	0.5
Colusa	35	0	17	11	28	0.8
Contra Costa	150	0	33	11	44	0.3
Fresno	225	2	158	21	181	0.8
Sacramento	31	0	11	12	23	0.7
San Joaquin	214	3	58	16	76	0.4
Solano	64	6	20	38	64	1.0
Stanislaus	17	0	13	2	16	0.9
Sutter	34	2	8	3	13	0.4
Yolo	107	1	37	12	50	0.5

CONCLUSIONS

As expected, the crops bordering tomatoes can and usually do influence rodent populations within the tomato planting (Davis 1939; Linduska 1942; Clark 1975; Cummings and Marsh 1978). Tomato vines provide the type of cover required by the three genus found in the fields (Batzli and Pitelka 1970; Sticker 1968). With the attractiveness of the tomato crop, growers and producers have a number of management options open to them.

Selection of planting site may be the first consideration. Avoiding border crops or areas that may lead to rodent infestations is desirable. Often a grower has no control over neighboring crops or noncrop land and thus unable to avoid potential problems. Also, the decision of what crops are to be planted in particular fields is often based on long-term crop-rotation plans designed to reduce weed, insect, nematode or plant disease problems, with rodents being of only minor concern.

Taking more action to minimize rodent contamination at harvest has been suggested as a possible solution. With the present harvesting equipment, there is little that can be done about reducing tomato contamination if the rodent population in a particular field is high. Possibly slowing the machine or putting more field sorters on the machine may provide some help. Unfortunately, the economics of the harvesting operations and often the rate at which tomatoes are ripening in the field usually preclude slowing the machines. Placing more people on the machines to hand-sort is seldom of help. Most people on the machines will actively avoid attempting to remove rodents from the sorting belts.

Using rodenticides in the tomato fields should be avoided. The harvesters cut at or even below the ground level to pick up the entire vine. If the rodents are alive, they may be able to run out ahead of the harvester and escape while dead rodents may be picked up at a higher rate. Since contamination is usually rodent hair in the product, the possibility of hair contamination is greater with dead mice being picked up with the tomatoes than when live mice are picked up.

Winter baiting with rodenticide-treated grains or pellets may provide some relief of the problem. Growers or fieldmen would need to inspect noncrop areas and perennial crops around fields to be planted in tomatoes. If rodent activity is noted, reducing the overwintering population with rodenticide applications will reduce rodent problems during the spring and summer.

Finally, habitat management, removing the noncrop habitat where the rodents overwinter, is of value (Batzli and Pitelka 1970; Marsh 1977). Without a nearby overwintering population, it will be possible to grow tomatoes with little or no rodent contamination.

FURTHER RESEARCH NEEDS

As the move toward mechanical harvesting of a greater variety of crops continues, there will be an increase in the rodent problems associated with those crops. A greater dependence on monitoring within and outside the fields, early control, and use of habitat management will be necessary. Research into more exact monitoring techniques, economic thresholds for rodent populations and methods of predicting outbreaks of rodents is of critical importance.

LITERATURE CITED

BATZLI, G.O., and F.A. PITELKA. 1970. Influence of meadow mice population in California. Grassland. Ecology 51(6):1027-1039.

CLARK, D.O. Ed. 1975. Vertebrate pest control handbook. Division of Plant Industry, California Department of Food and Agriculture.

COOPER, J.L. 1982. National Food Processors Association. 1133 20th N.W., Washington, D.C. (Personal communication.)

CUMMINGS, M.W., and R.E. MARSH. 1978. Vertebrate pests of citrus. The Citrus Industry; Vol. IV: 237-273.

DAVIS, W.B. 1939. The recent mammals of Idaho. The Caxton Printers, Ltd., Caldwell, Idaho.

HAMPTON, D. 1981. Hampton Farming, Santa Maria, California. (Personal Communication.)

LINDUSKA, J.P. 1942. Winter rodent populations in field-shocked corn. J. Wildl. Mgmt. 64(4):353-363.

MARSH, R.E. and W.E. HOWARD. 1977. The house mouse: its biology and control. Leaflet 2945. University of California, Division of Agricultural Sciences. 31pp.

MARTIN, J.H., W.H. LEONARD, and D.L. STAMP. 1976. Principles of field crop production. Macmillan Publishing Co., New York.

STICKEL, L.F. 1968. Home range and travels. J.A. King, ed. Biology of Peromyscus, pp. 373-411. American Soc. of Mamm.

VANDEVANTER, G. 1982. Crop Science Department, California Polytechnic State University, San Luis Obispo, California. (Personal communication.)