Monitoring aphids on Brussels sprouts

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California Brussels sprout growers, lacking adequate sampling techniques to determine economically significant damage by insects, historically have applied preventive sprays of pesticide combinations after each irrigation (approximately every 18 days). An average of 19 pounds (active ingredient) of insecticides per acre were applied by growers in 1981.

In Santa Cruz County, 900 acres of Wilder Ranch State Park are leased to Brussels sprouts growers, an acreage representing 16 percent of the 5,400 acres of the crop planted in California. When the state purchased the park several years ago, it was with the understanding that agriculture would be preserved. To mitigate potential conflicts among growers, park users, and the community, an integrated pest management (IPM) program was proposed, using monitoring to reduce the use of pesticides.

There are three important species of insect pests on Brussels sprouts: the cabbage maggot, *Hylemya brassicae* (L.); the green peach aphid, *Myzus persicae* (Sulz.); and the cabbage aphid, *Brevicoryne brassicae* (L.). Cabbage maggots directly damage plants and may reduce stand and yield. However, aphids cause growers the most concern, because inspection by processors can lead to rejection of the crop if contamination standards are not met. Rejected loads must be sold on the fresh market or dumped if there is no market.

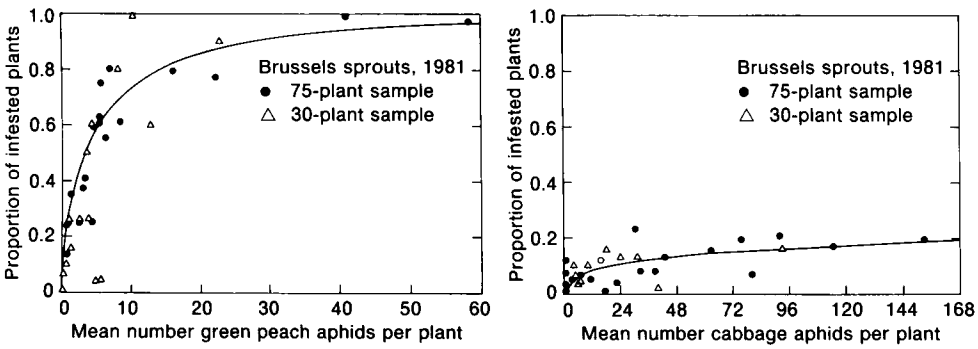
Green peach aphids feed on the undersides of leaves on the lower portions of plants and rarely contaminate the crop at harvest. Cabbage aphids prefer young, apical leaves and readily move onto the forming heads of Brussels sprouts. They are, therefore, the major source of insect contamination in the harvested crop. Counting the number of aphids per plant is time-consuming, and aphids are often clumped in"hot spots." A time-efficient sampling plan is necessary for monitoring aphid populations.

In an effort to develop such a technique, we sampled four commercial fields from planting in mid-August to harvest in mid-November, thoroughly examining the entire plants and counting all the green peach and cabbage aphids. We sampled three of the fields once a week, examining 75 plants. The fourth field was sampled three times during the season, and 180 plants were examined each time.

Cabbage aphids are usually clumped in their distribution patterns, as indicated by the rapid rate at which the variance increases as a function of the mean (see graph). This may confirm the observation that some of the cabbage aphids appear to be introduced into the field during transplanting. Colonies resulting from these infestations increase to high densities before dispersal begins. The population level at any particular time, as illustrated in these relationships for each aphid species, can be used to develop a sequential sampling plan, whereby samples will be analyzed as they are made, until insect populations reach levels of economic damage. Further information required includes estimates of control decision thresholds and error rates.

At present, we do not have quantitative data for accurately assessing control action thresholds of either aphid species on Brussels sprouts. However, a provisional threshold might be used, taking into account that cabbage aphids are the major source of contamination, and green peach aphids are rarely considered to be pests except at high densities. Proportion-infested thresholds of 15 percent for cabbage aphids and 80 percent for green peach aphids seem to be realistic. This follows the threshold on broccoli of 100 cabbage aphids per plant, developed by researchers at the University of California, Riverside.

A sampling form was developed to provide control decision lines for both



Estimated and observed proportions of infested plants as related to aphid density.

Sequential sampling decision lines for monitoring aphids on Brussels sprouts

	Number of plants with aphids			
	Cabbage aphids		Green peach aphids	
No. plants sampled	Don't treat	Treat	Don't treat	Treat
10	0	4	5	10
15	0	5	9	14
20	1	6	13	18
25	2	7	17	22
30	2	8	20	27
35	3	9	24	31
40	3	10	38	35
45	4	11	32	39
50	4	12	35	44

aphid species (see table). A minimum of 10 randomly selected plants should be sampled (recognizing that plants along borders will have higher infestation levels), and the presence or absence of each species recorded rather than the total number of aphids counted. This 10-plant minimum sample provides reliability, and may result in lower error rates than the 0.10 level designed into the sequential sampling plan. If after 10 plants are sampled, the cumulative number of infested plants is between the no-treat and the treat control decision lines, additional samples are required. Sampling is discontinued for either aphid species when the cumulative sum reaches or exceeds either control decision line. If 50 plants are sampled with no decision being reached, a decision is deferred until the next sampling date. It has been shown for other pests that sequential sampling saves up to 65 percent of the time taken by conventionally fixed sampling procedures having comparable error rates.

Presence-absence sequential sampling offers additional savings, because it is not necessary to count individual aphids. Another anticipated advantage is an improvement in timing of pesticide sprays and a reduction in the number of sprays. Further research is being conducted at Wilder Ranch State Park to apply the use of the sequential sampling plans in an integrated pest management program for both fresh market and processed Brussels sprouts.

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California property tax shifts before Proposition 13

Michael Arnold

Local government spending wasn't "out of control" as commonly thought

Before the passage of California's Proposition 13 in June 1978, substantial increases in many homeowners' property taxes received widespread publicity. Quite naturally, many people interpreted these increases as reflecting large increases in local government expenditures, which they concluded had "gotten out of hand."

A careful examination of the data on total property tax collections and local government expenditures does not support the popular interpretation. After population increases and inflation are accounted for, neither total property tax collections nor local government expenditures in the three years preceding the election grew disproportionately with past trends. However, property taxes collected from single-family dwellings grew substantially in those three years and in comparison with the earlier period, even after accounting for inflation and the increase in single-family dwelling units. Moreover, a simple accounting model shows that, even if real local government expenditures per California resident had been constant from fiscal years 1975 through 1978, property taxes collected from each single family dwelling unit would have risen by a sizable amount.

The revenue figures show that actual total property tax collections rose substantially within each period as well as between periods (table 1). However, when increases in inflation and population are accounted for, property tax collections per California resident increased 1.3 percent per year between fiscal years 1968 and 1975. This compares with a 2.4 percent annual rate of growth in the three years preceding the

TABLE 1. Measures of total property tax collections and local government expenditures in California, selected periods

Category	Average annual changes, fiscal years: 1968 — 1975	1975 — 1978
	Property taxes collected	
	%	%
Total property taxes collected	8.4	11.8
Real property taxes collected per Calif. resident	1.3	2.4
Property taxes/Calif. personal income	−0.4	0.0*
	Local government expenditures	
	%	%
Total local govt. expenditures	11.0	12.2
Real total local govt. expenditures per Calif. resident	1.9	2.9
Real total local govt. expenditures per Calif household	0.8	1.9
Real total county expenditures per Calif. resident	2.2	1.8
Real total school (K-12) expenditures per ADA †	0.6	1.3

Sources: Actual figures deflated using GNP deflator for "State and Local Expenditures" in U.S. Dept. of Commerce, *Survey of Current Business*. Households from the Center for Continuing Study of the California Economy data file. Expenditures and revenues from : Michael Arnold, "Shifts in California's Property Tax Burden Before Proposition 13," Working Paper 82-09, Center for Continuing Study of the California Economy, Palo Alto, August 1982; California State Controller's Office, *Annual Report, Financial Transactions Concerning Cities, . . . Counties, . . . Districts, . . . Special Districts* (four separate reports).

*Between zero and — 0.05 percent.

†Expenditures for kindergarten through 12th grade per ADA (average daily attendance).