Cooperative Extension

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2002 YUMA COUNTY AGRICULTURAL STATISTICS

GEOGRAPHY: Yuma County, in southwest Arizona, encompasses approximately 5,561 square miles of desert interspersed with rugged mountains. An abundance of arable land in valley regions, coupled with a warm, dry climate and ample surface water, results in a thriving agricultural business. There are 238,900 acres of farm land harvested in Yuma County. The Colorado River is the source of irrigation water for the Yuma Mesa and surrounding valleys. Yuma County diverts 1.2 million acre feet of Colorado River water per year, accounting for over one-third of the 2.8 million acre feet of Colorado River water allotted for Arizona. The county agricultural water use totals 920,000 acre feet per year. Crops grown east of the Wellton-Mohawk project and east of San Luis are irrigated from wells. Federal and State governments own 89% of the county's total land and 11% is privately owned.

CLIMATE: Average length of growing season (days above 32° F minimum) is 340 days at the Yuma Mesa Ag Center and 350 days at the Yuma Valley Ag Center. Some areas are almost frost-free. Sunshine averages 91.2% of possible time with the average annual high temperature of 87.9°F and the average annual low temperature of 60.5°F with an average monthly temperature of 73.8°F. Average yearly rainfall in Yuma County is 3.76 inches.

AGRICULTURE: The value of crops, fruits and vegetables produced on Yuma County farms and ranches was $1,224,296,000 in 2002. The value of all agriculture commodities produced in Yuma was over $1.3 billion in 2002.

Principal field crops produced are grain, hay and cotton. Vegetable crops continue to be increasingly important and generated over $1.07 billion in 2002, the highest returns for any commodity group. Lettuce was the principal vegetable crop with supplies available from mid November into April, and grossing over 89% of the vegetable income. Citrus fruit grossed almost $45.7 million in 2002, with lemons as the major crop. Seed crops are important with more than 4,500 acres grown, grossing over $12.6 million.

Sales of fat cattle is the county's leading livestock operation. Most of the money generated by the livestock industry is from cattle on feed. Sheep graze alfalfa fields from late fall through winter. Figures on gross income from livestock indicate over 98,000 cattle on feed and 22,000 sheep and lambs, ranking third in Arizona, valued at over $79.1 million.

The 1997 farm census indicates 465 farms averaging 511 acres per farm. The Yuma Agribusiness profile published on 2/90 by the Arizona Department of Commerce indicates that 211 agricultural related businesses exist in Yuma County. Ag employment peeks in December. In 1996, agriculture employed 45,984 workers.

Prepared by Barry Tickes and Mohammed Zerkoune, Extension Agents, Agriculture and Barry Bequette, Extension Director using Arizona Crop & Livestock Reporting Service 2002 Arizona Agricultural Statistics and other sources.

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Yuma County Agricultural Statistics 2002

CROPS	Crop	Acres	Av. Per Acre	Av. Price	Value/Acre	Gross
FIELD	Cotton Lint SS	17,900	1397 lbs.	0.489 lb.	$683.13	$ 12,228,080
	Cotton Lint LS	2,100	1120 lbs.	0.828 lb.	927.36	1,947,456
	Alfalfa Hay	32,000	8.6 tons	98.2 ton	844.52	27,024,640
	Other Hay	18,000	3.9 tons	93.50 ton	364.65	6,563,700
	Bermuda Seed	5,800	400 lbs.	1.50 lb.	600.00	3,480,000
	Durum Wheat	44,300	5820 lbs.	133.30 ton	387.90	17,184,102
	Other Wheat	2,100	6340 lbs.	130.00 ton	412.10	865,410
	Barley		-	-	-	-
	Corn for Grain	1,900	10,880 lbs.	110.70 ton	602.20	1,144,195
	Misc. Seed Veg.	4,500	-	-	2,800.00	12,600,000
	Total	131,000				83,037,583
VEGETABLES	Lettuce, Head	50,500	360	38.7	13,932.00	703,566,000
	Lettuce, Leaf	5,800	315	61.8	19,467.00	112,908,600
	Romaine	12,500	275	43.4	11,935.00	149,187,500
	Cauliflower	4,300	175	45.9	8,032.50	34,539,750
	Broccoli	7,600	122	45.7	5,575.40	42,373,040
	Cantaloups	3,800	300	13.2	3,960.00	15,048,000
	Potatoes	300	270	13.4	3,618.00	1,085,400
	Spinach	450	225	30.7	6,907.50	3,108,375
	Watermelon	1,400	405	8.38	3,361.50	4,706,100
	Honey Dews	300	310	16.4	5,084.00	1,525,200
	Misc. Veg's.*	1,750				6,488,740
	Total	88,700				1,074,536,705
TREE & VINE	Grapes	900	3.50 ton	947.00 ton	3,314.50	2,983,122
	Lemons	13,300	384 Ctn	7.31 Ctn	2,807.04	37,333,632
	Grapefruit	600	308 Ctn	3.37 Ctn	1,037.96	622,776
	Valencia	1,100	94 Ctn	1.71 Ctn	160.74	176,814
	Navel & Sweet	300	440 Ctn	6.37 Ctn	2,802.80	840,840
	Tangerines	3,200	265 Ctn	7.92 Ctn	2,098.80	6,716,160
	TOTAL	194,000				$ 48,673,344
	Total Crops	238,900				$ 1,206,247,632
LIVESTOCK	Total includes Fat Cattle, Sheep & Lambs, and Misc. Livestock ***- Est. based on AZ totals of inventory & gross income***					$79,196,000
Total Agricultural Gross Income 2002 Yuma County						**$ 1,285,443,632**

* Includes Bok Choy, Cabbage, Kale, and Napa

Water District Outages

Wellton Mohawk Irrigation and Drainage District

December

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

Yuma Mesa Irrigation and Drainage District

December

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

Yuma Irrigation District

December

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

Yuma County Water Users Association

December

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1	2	3 West Main	4	5	6
7	8	9	10 East Main	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

Unit B Irrigation District

December

Sun	Mon	Tue	Wed	Thu	Fri	Sat
Starts 11/29	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

Foxglove Aphid: Is it an Emerging Pest in the Desert?

John Palumbo, *Yuma Agricultural Center*

Note: **Winged foxglove aphids were found on head lettuce in the Yuma Valley near Co. 15th and the west main canal this past week. It's probably not a coincidence that the earliest reports of foxglove aphids were found in this same area last November. Although, no colonization by foxglove or any aphid species has been reported in lettuce yet, these findings should serve as an indication to PCA's and growers that foxglove aphids could potentially be present in large numbers again this winter and spring. In the report below, I discuss our experiences with foxglove aphids and the environmental factors which may influence their population growth and abundance on desert lettuce.**

Introduction

Aphids are one of the most important insect problems in head lettuce grown in Arizona. A new aphid species, the foxglove aphid, *Aulacorthum solani*, was found infesting commercial lettuce fields in the Yuma area for the first time this past growing season. Foxglove aphids are thought to occur throughout the U.S and Canada, but its effect is generally greatest in the eastern regions of the continent. It is also found worldwide, but is probably of European origin. Surprisingly, it has been known to occur in California since at least 1940, and along with the lettuce aphid, *Nosanovia ribis-nigri*, has caused problems for lettuce growers in Salinas area for the past several years. Although, the lettuce aphid is the more important of the two in Salinas, studies last spring suggest that foxglove aphid may be a more important pest in the desert.

The foxglove aphid appears to be similar to the lettuce aphid in that the alates (winged forms) are difficult to differentiate, both aphids have short life cycles that allow populations to build up rapidly, and both tend to prefer to colonize the youngest tissue near the terminal growing point of the plant. Apterae (wingless forms) foxglove aphid are also often confused with the green peach aphid, *Myzus persicae*. Both aphids are usually yellow-green to all green but the green peach aphid may also be somewhat pink or red, as is the lettuce aphid. The foxglove aphid is slightly larger (maximum length is 3.0 mm) than the green peach aphid (max. length is 2.3 mm). One way to distinguish these two aphids is by the dark joints found on legs and antennae of the foxglove aphid, and the dark tips of the cornicles. The green peach aphid also has pale-colored legs and antennae but without dark joints. Foxglove aphids are also unique in that they have a bright green or dark colored spot at the base of each cornicle. Alates have a pattern of transverse dark bars on the dorsal abdomen.

The foxglove aphid was not previously thought to occur in Arizona. It is principally considered a serious pest of potatoes and is also found on ornamental and greenhouse plants. It is considered an occasional pest of lettuce and leafy vegetables grown in Canada. Unlike the lettuce aphid which was first found in Yuma five years ago, the foxglove aphid is known to colonize a much broader range of plant hosts, including a wide variety of weeds, ornamentals and crops. This large availability of hosts and apparent adaptation to our winter and spring growing conditions suggests that foxglove aphids might present growers with some new challenges.

There is much uncertainty surrounding this new species, and its ability to thrive within our desert growing conditions. We are not sure how or when the foxglove aphid moved into the Yuma area, but it seems likely that it may have arrived via transplants or harvest equipment, much like we suspect with the lettuce aphid. Because this species is polyphagus and utilizes a number of known host plants grown in the desert, we are concerned that foxglove aphids may become an established pest on our winter/spring crops. In terms of management, control with foliar aphicides appears to be more difficult because the aphids preference for the protected terminal growth. We have had the opportunity to conduct a considerable amount of field research over the past two growing seasons to learn more about this pest. Because of the importance of the foxglove as a contaminant of lettuce and other leafy vegetables, we designed several studies to its examine its population growth, distribution, and damage potential.

Research Methods

The incidence and distribution of foxglove aphids in the Yuma growing area was measured in several different ways for this report. First, information describing seasonal aphid activity on an area-wide basis was generated from a network of yellow sticky traps that were monitored weekly from late August through March. We have been monitoring aphid activity since 1998 and have specifically been identifying foxglove and lettuce aphid species. Yellow sticky traps were located at several sites throughout Yuma County's vegetable growing areas. Three- five trapping stations were situated in the Yuma Valley, Gila Valley and Dome Valley/Roll areas for a total of 17 trap locations. In addition, in 2002-2003 we situated traps along the Colorado River in the Yuma Valley. At least one location in each growing area was situated near an AZMET weather station. The approximate location of traps in each valley was selected with the assistance of local PCAs. At each site, a single yellow sticky traps was placed in an open area adjacent to or near a field. Traps were collected 1-2 times per week and replaced. Sticky traps were taken to the laboratory where all aphids were counted and recorded. Only 6 aphid species were consistently identified (foxglove, lettuce, green peach, cabbage, potato, and cowpea aphids). Data from trap captures was converted to the mean number of winged aphids / trap/ day and presented in a graphic format.

Surveys of commercial lettuce fields were conducted in the 2002-2003 growing season to document the incidence of foxglove colonization. Working with cooperating growers, surveys were conducted from 20 Dec through 24 Feb in 1-7 fields per week. Both head lettuce and romaine were sampled and none of the fields surveyed had been treated with imidacloprid (Admire). Fields ranged from 9-22 acres in size and were located in the north Yuma Valley, south Yuma Valley, and Gila and Dome Valleys. On each survey date, at least 20 lettuce plants in a single location in each field were randomly selected and sampled for the presence of foxglove aphids. Each plant was sampled by visually examining all plant foliage and estimating the number of alate and apterous aphids present. The number of infested fields, percentage of infested plants and average number of aphids per infested plant were summarized for all fields surveyed on each sample date.

To examine the population dynamics and damage potential of foxgloves experimental field plots were established in head lettuce at the University of Arizona, Yuma Agricultural Center as part of an on-going study. Beginning in mid-October 1999, ¼ acre plots of head lettuce were planted on 2-3 week intervals. Table 4 provides the planting date and lettuce variety for each planting. On each planting date (wet date) lettuce was direct seeded into double row beds on 42 inch centers. Each planting was subdivided into 4 plots consisted of 4 beds, 150 feet long. Plots were arranged in a randomized complete block design with four replications. No insecticide applications were made during the study. Aphid populations were assessed by estimating the number of aphids/plant by taking whole plant destructive samples. On each sampling date, 10 plants were randomly selected from each plot and placed individually into large 4-gal tubs. Each plant was sampled by visually examining all plant foliage and counting the number of alate and apterous aphids present. At harvest, infestation levels of apterous aphids were estimated by randomly selecting 10 plants within each replicate, visually counting the number of aphids on frame/wrapper leaves and heads, and separately recording aphid numbers for each location. Weather data observed from the AZMET station at the Yuma Ag Center was used to examine the influence of temperature and rainfall on foxglove abundance and population growth.

Research Results and Significance

Light populations of foxglove aphids were first found colonizing untreated head lettuce in small experimental plots at the Yuma Agricultural Center (YAC) in the spring of 2001. Initially, the aphids were thought to be potato aphids, but were later identified as *A. solani*. This was further verified in the spring 2002 when aphids found on untreated experimental lettuce plots at YAC were identified as foxglove aphids. However, no foxglove aphid has been reported from PCAs or growers that season. Furthermore, winged alate aphids had not been found in the Yuma area for the past several years . In general, aphid flight activity as measured by sticky trap captures varies considerably throughout the region. The most consistent bimodal patterns are found in the Yuma Valley. Most of the aphids captured on these traps consisted of a number of unidentified aphids, as well as those we identified (cowpea aphid, cabbage aphid and green peach aphid). In 2002,/2003 aphid numbers were relatively low in the Gila and Dome Valley growing areas and no foxglove alates were found on traps (Figure 1). However, aphid numbers were more abundant in the Yuma Valley, particularly near the Colorado River, where traps captures during the spring were much higher than other areas (Figure 1). Foxglove alates were found on traps in the Yuma Valley on 10 Dec at Ave I and 21st, and then again on 7 Jan at Ave F and Co. 14th. Foxglove aphids were found fairly regularly on traps placed on the Colorado river beginning on Jan 7. This occurrence coincides with unseasonable warm weather we experienced in January of 2003.

The first documented incidence of foxglove aphid colonies in commercial lettuce occurred on Nov 12, 2002 in the Yuma Valley (Ave. D and Co. 12th st.). A PCA discovered a small number of apterous foxglove aphids colonizing pre-harvest stage head lettuce. The field was located adjacent to a residential area with Pecans trees. The field had not been treated with Admire. Following treatment with a foliar insecticide, the aphids were not found again in that field. On Nov 20, a small number of apterous foxglove aphids were found on wrapper leaves of head lettuce that was being harvested in the Yuma Valley (Co. 13 and Ave F). This field was located within a ½ mile of a citrus orchard and had not been treated with Admire. Then on Nov 24, a single alate foxglove aphid was found on untreated head lettuce on Co. 15th near the west main canal and a pecan orchard. Similarly, a few alate foxglove aphids were found on head lettuce on Co. 14th and Somerton Ave on Nov 27th, again on untreated lettuce. We did not receive further reports from PCAs until January when foxglove aphids infestations were becoming more common throughout the Yuma Valley. Results of our field surveys of untreated lettuce showed that foxglove aphids were sporadic in the Yuma Valley throughout December, but became more consistent during January and February (Table 1). Surprisingly, foxglove aphids were not reported from PCAs in either the Gila or Dome Valley growing areas, nor were they found in our commercial field surveys.

In most cases, the commercial fields infested with foxglove aphids were near the Colorado River and/or adjacent to citrus orchards and residential areas. Unlike the lettuce aphid which was first found in Yuma five years ago, the foxglove aphid is known to colonize a much broader range of host plants (Table 2). These include a wide variety of weeds (i.e., Shepard's purse, ground cherry, pigweed), ornamentals (i.e., geraniums, gladiolas, verbena) and crops (i.e., cucurbits, beans, canola, spinach, citrus, safflower, tomatoes) that are commonly found throughout the growing region in cultivated fields, residential areas, or along the Colorado and Gila rivers. This large availability of hosts, available year round in some cases, could allow the foxglove aphid to become an established pest of lettuce and other leafy vegetables. However, why foxglove aphid was not found in the Gila and Dome Valley areas, given their similarity in host crops, is unclear.

Aphid populations in general were higher in 2003 than in the previous 10 years, based on a summary of small plot efficacy trials planted during mid-November (Figure 2). There does not appear to be a strong correlation with seasonal heat unit accumulation or rainfall. The peak in aphid numbers seen this past year was a result of a greater abundance of the green aphid complex (green peach aphid, potato aphid and *Acyrthosiphon lactucae*, a common aphid species found in Yuma) as well as a the emergence of the foxglove aphid (Table 3). Numbers of *A. lactucae* were very high this year, relative to previous years, peaking in mid-November and December wet dates. In contrast, green peach and potato aphid populations have been very light the past few years. Lettuce aphids also reached peak numbers in 2003. Foxglove aphids numbers on untreated lettuce were also much higher in 2003 than in 2002 (Figure3), peaking during March (in the Dec 3 planting) in both years.

Figure 4 shows a comparison among the aphid species in individual lettuce plantings last season. This data shows that the foxglove aphid appears to have a much broader range of activity in desert lettuce than the other species. Traditionally we have concluded that lettuce crops are susceptible to economic infestations from aphids when planted beginning in mid-November. Foxglove aphids last year were the dominant species in October plantings, particularly in the late October when populations reached levels exceeding 60 aphids/plant at harvest. Although the *A. lactucae* was the dominant species in the November and December plantings, foxglove aphid populations also reached high numbers, reaching densities greater than 300 aphids per plant during March.

Based on our studies over the past several years we have also made some other interesting observation concerning aphids in lettuce. First, the high aphid densities occurring last season may have been influenced by both temperature and rainfall (Table 3). Temperatures were similar for each planting, averaging 58-59 F. Unlike the previous three years, the average max and min temperatures in 2002-2003 were fairly uniform for each planting, presumably causing little disruption in aphid population growth. Another interesting observation was the consistent amount of rainfall that was received during the last 4 planting windows, averaging well over an inch of rain. We have felt for years that rainfall benefited aphid abundance in desert lettuce production. Similarly the green aphid complex reached higher number in 2000-2001 under considerable rainfall. This data further support our contention that growers may be at more risk from aphid infestation during mild, wet winter conditions.

Another observation from last year concerned the distribution of foxglove aphids within lettuce plants. Table 3 shows the numbers of aphids on both heads and frame leaves measured at harvest. This data clearly shows that aphids caused economic damage (head contamination) to head lettuce in the November and December plantings in 2002-2003. However, more aphids were found on the frame and wrapper leaves (53 % in 2002, 68 % in 2003) than were found in the head at harvest (47 % in 2002, 32 % in 2003). This is quite different from the other aphid complexes. Lettuce aphids are consistently found in greater numbers in the head (>90%) and populations of green aphids are less commonly found in heads (<25%). Foxglove aphids were found to colonize plants differently as well throughout the season. It has been my experience that this aphid has a tendency to disperse widely among leaves, often found near the butt of plants, rather than forming close-knit colonies as green peach aphid and lettuce aphids do.

In conclusion, it now appears that foxglove aphids have become an established pest of lettuce in the desert southwest. We have seen a progressive buildup each year of their number and currently appear to be centered in the Yuma Valley. The large availability of hosts and apparent adaptation to our winter and spring growing conditions suggests that foxglove aphids might continue to be present in our region. Although they have not been found in the Gila and Dome Valleys yet, the fact that many of the same host are available for colonization suggest that they will eventually show up in these areas. Management of foxglove aphids has not been well studied, largely because it has only recently been found in commercial lettuce. Insecticide efficacy trials from last season have shown that several registered insecticides provided adequate control of these aphids (see articles below). Application of Admire, which has been the standard for aphid control in the desert, is strongly recommended for foxglove aphid control in spring lettuce. Furthermore, given the discovery of winged foxglove aphids, and the projections by the National Weather Service (http://www.cpc.ncep.noaa.gov) that temperatures this winter will likely be warmer than the long-term averages, growers should consider applying Admire at higher rates (19-20 oz/acre) for late November and December plantings.

For Additional Information on Foxglove Aphid Biology and Management visit the following articles at the Arizona Crop Information Site: *http://ag.arizona.edu/crops/*

- Insect Management For Desert Lettuce Production
- Foxglove Aphids in Lettuce: Control with Reduced-Risk and Conventional Insecticides
- The Emergence of the Foxglove Aphid, *Aulacorthum solani*, as an Economic Pest of Lettuce in the Desert Southwest

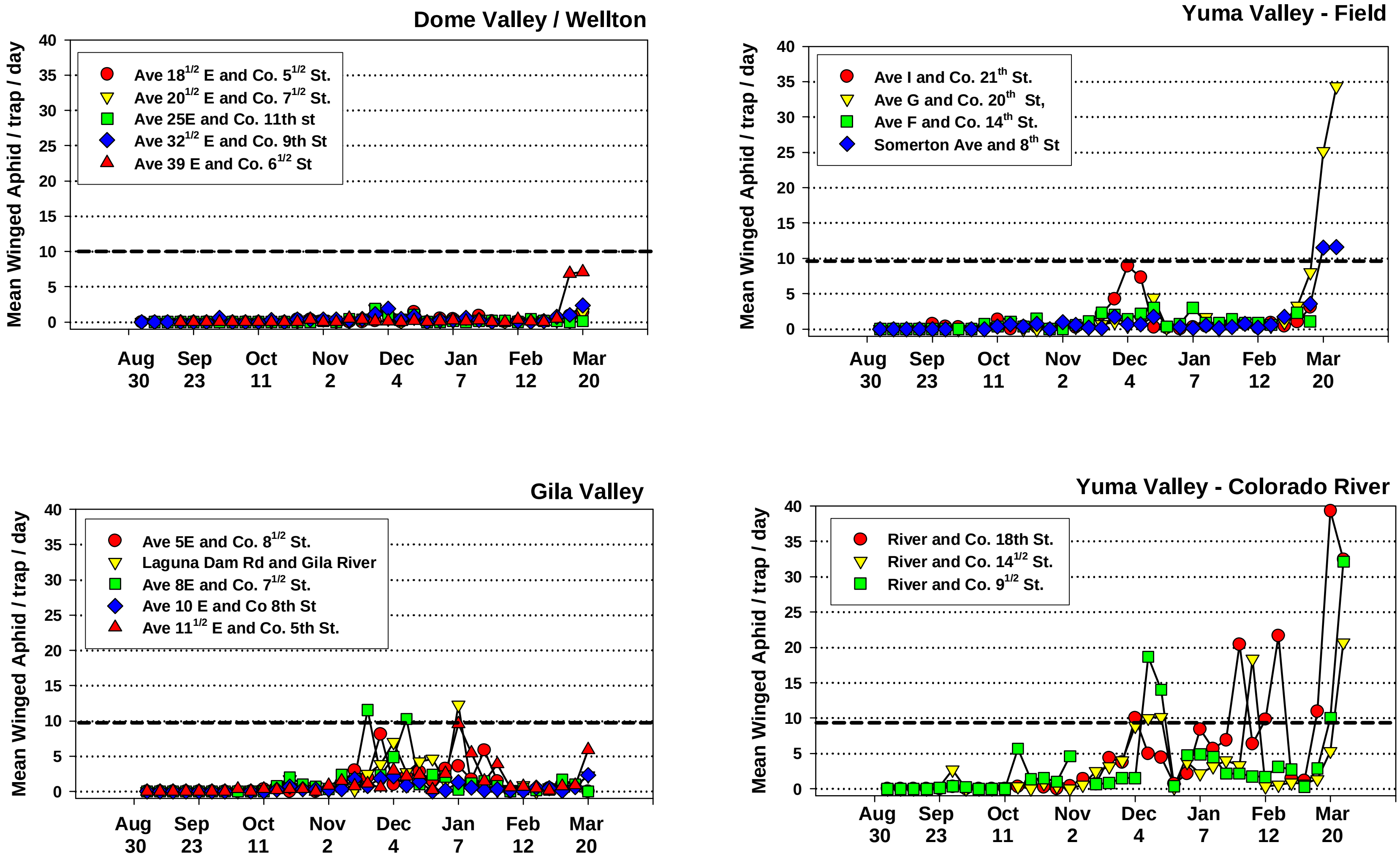

Figure 1. Seasonal aphid flight activity (all aphid species) as measured by yellow sticky traps during, 2002-2003

Table 1. Results of surveys of commercial head lettuce and romaine fields for the presence of foxglove colonies, Yuma, 2002-2003

						Foxglove Aphid in Infested Lettuce Fields [b]			
			Plant	No. fields	No. fields	% infested plants		Avg. aphids/ infested plant	
Date	Location[a]	Crop	Stage	surveyed	infested	Winged	Non-winged	Winged	Non-winged
20-Dec	NYV	Romaine	Pre-harvest	4	1	10	10	1	2
27-Dec	SYV	Romaine	Harvest	3	0	0	0	0	0
27-Dec	NYV	Head lettuce	Harvest	3	0	0	0	0	0
31-Dec	NYV	Head lettuce	Harvest	3	0	0	0	0	0
31-Dec	NYV	Romaine	Harvest	2	1	0	5	0	5
31-Dec	SYV	Romaine	Pre-harvest	3	0	0	0	0	0
8-Jan	DG	Romaine	Harvest	6	0	0	0	0	0
8-Jan	NYV	Romaine	Harvest	3	1	0	5	0	3
8-Jan	NYV	Head lettuce	Harvest	1	0	0	0	0	0
15-Jan	NYV	Romaine	Pre-harvest	3	1	10	5	1-2	7
15-Jan	NYV	Head lettuce	Pre-heading	3	0	0	0	0	0
18-Jan	SYV	Romaine	Harvest	2	2	25-50	50-100	1-3	10-15
22-Jan	NYV	Head lettuce	Pre-harvest	4	1	0	20	0	20-25
22-Jan	NYV	Romaine	Pre-harvest	1	0	0	0	0	0
3-Feb	DG	Romaine	Pre-harvest	7	0	0	0	0	0
3-Feb	NYV	Romaine	Pre-harvest	4	2	10	15	1	1-5
10-Feb	SYV	Head lettuce	Harvest	2	1	70	70	>5	>50
10-Feb	NYV	Romaine	Pre-harvest	2	0	0	0	0	0
17-Feb	NYV	Romaine	Harvest	3	3	50-100	10-100	1-2	5-25
24-Feb	NYV	Head lettuce	Heading	2	1	0	20	0	5-10

[a] NYV= Yuma Valley (North of Co.15th); SYV= Yuma Valley (South of Co. 15th); DG= Dome Valley / Gila Valley

[b] Surveys consisted of sampling 20 plants in 1 location per field; averages reflect the estimated number of aphids found on the most infested plants

Table 2. List of crop, weed, and ornamental plants that Foxglove Aphid has reportedly been observed feeding on in California in 1945-1946. (Essig 1947, Hilgardia 17: 597-616).

Weeds		Ornamentals	Crops
Ragweed	Creeping woodsorrel	Hollyhock	*Celery*
Pigweed	Ground cherry	Begonias	*Brassicas*
Camomile	Purslane	Chrysamthumum	Squash
Snapdragon	Curly dock	Foxglove	Pumpkin
Burdock	Silverleaf nightshade	Poinsettia	Strawberry
Milkweed	Annual sowthistle	Geranium	Soybean
Shepards purse	Dandelion	Gladiolas	Tomato
Lambsquarter	Common mullein	Lilies	Mint
Field bindweed		Orchids	Beans
Sunflower		Primrose	Peas
Henbane		Verbena	Potato
Purple deadnettle		Periwinkle	Eggplant
Henbit		Pansy	Citrus
Sweet clover			

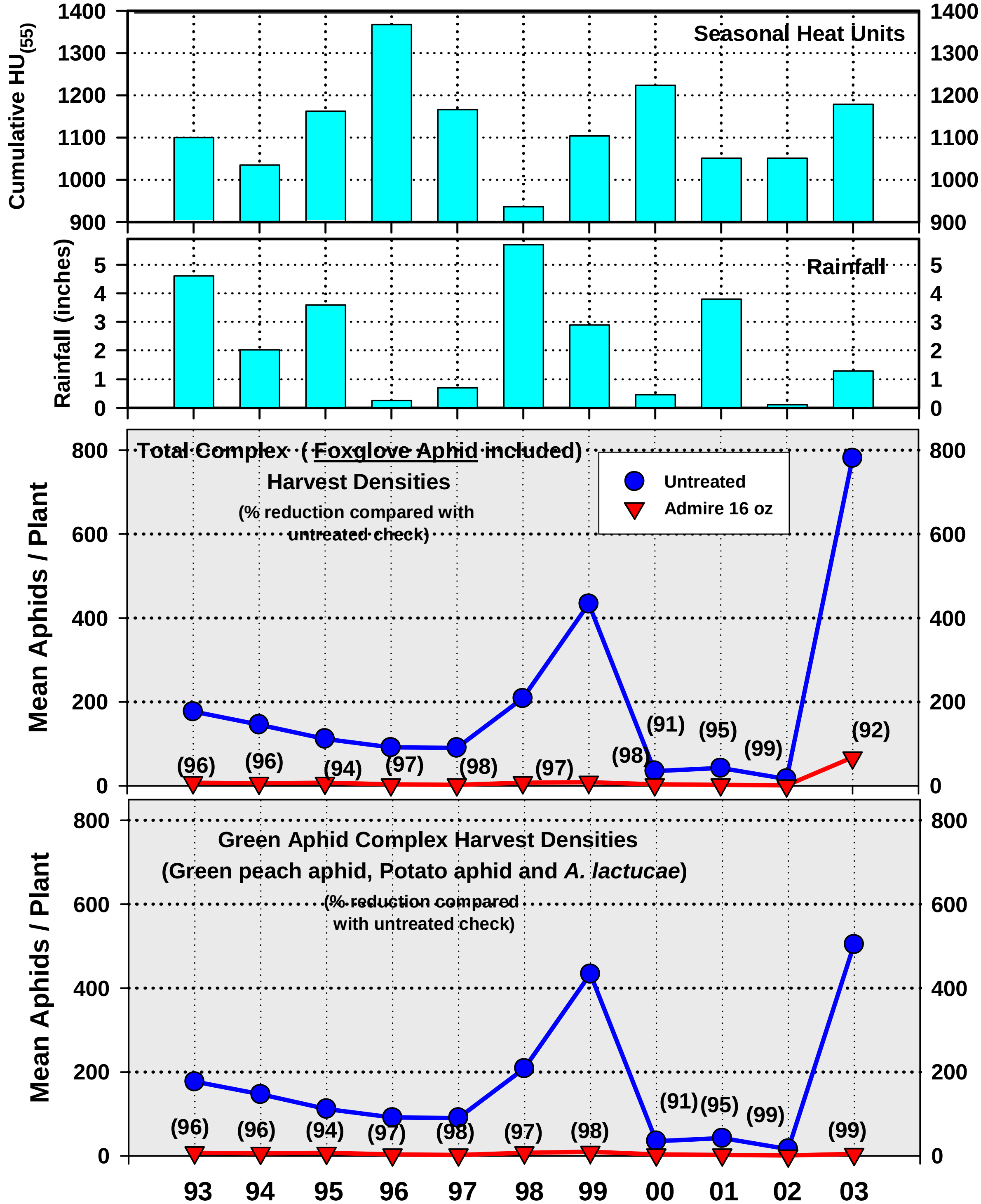

Figure 2. Average aphid abundance on Admire-treated and untreated head lettuce at harvest from 1993-2003. Data was summarized from 2-3 efficacy trials conducted at comparable times in each year where lettuce plots were planted during mid-November.

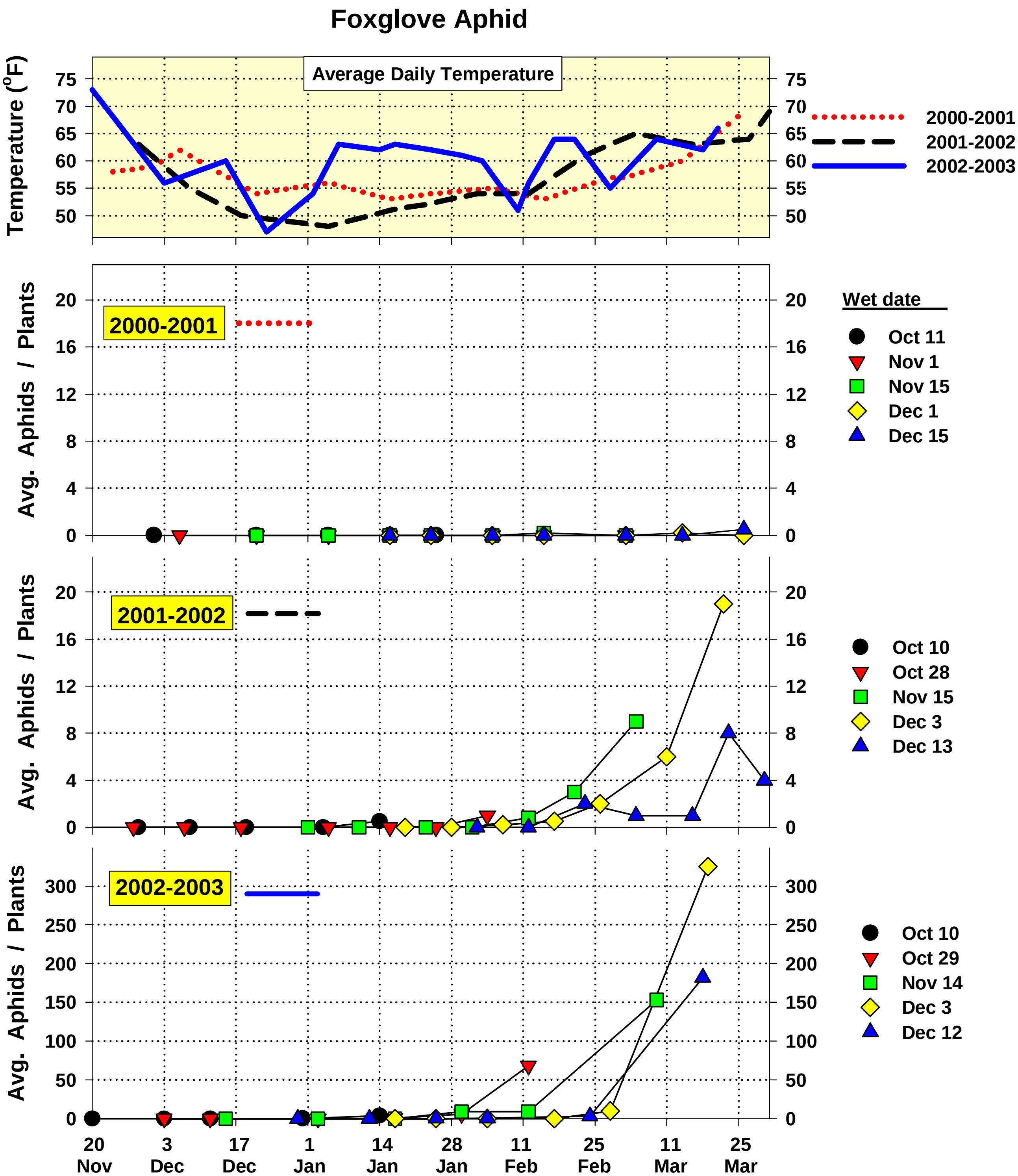

Figure 3. Average Foxglove Aphid densities on untreated head lettuce planted at intervals during the growing season, Yuma Agricultural Center, 1999-2003.

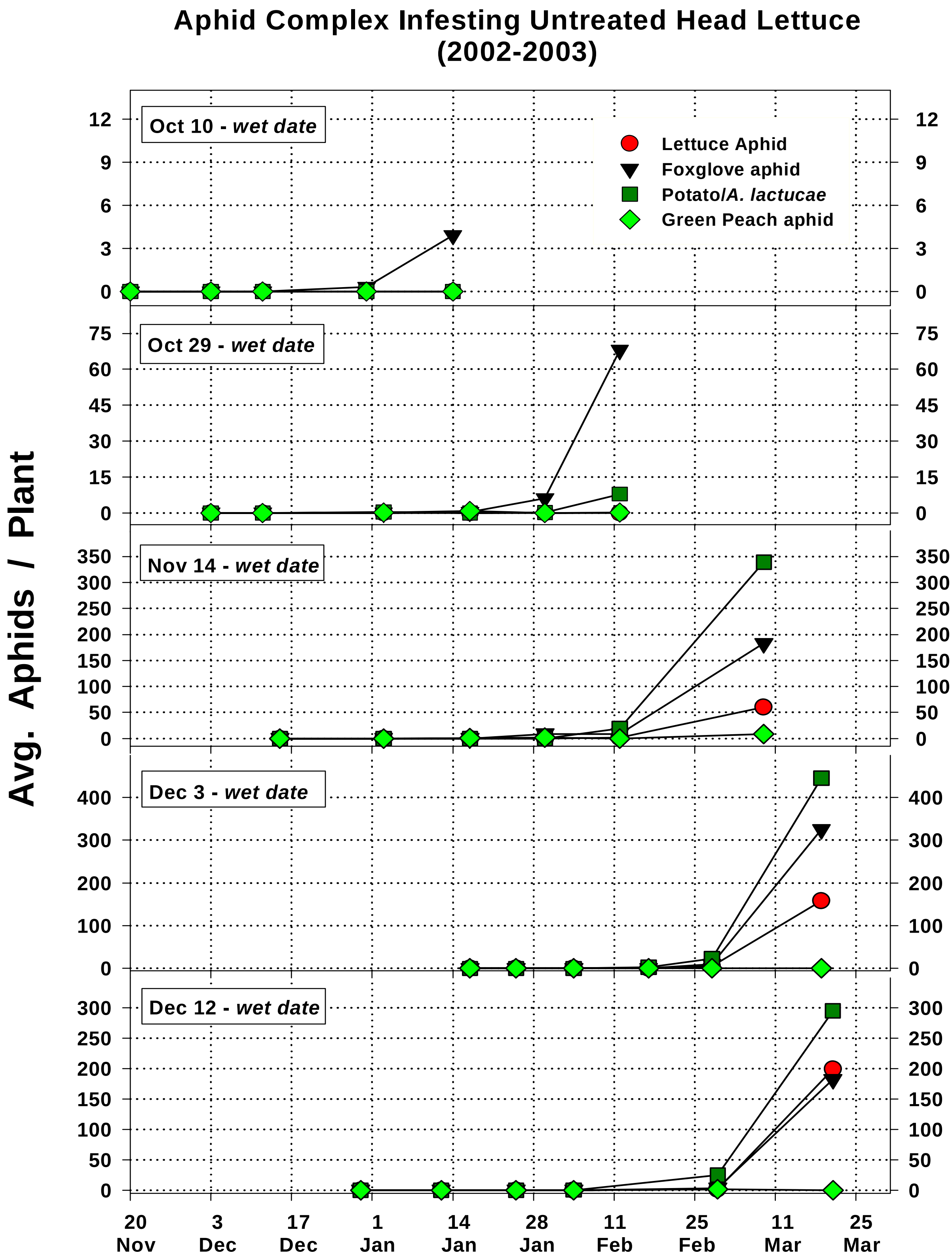

Figure 4. Relative comparison of aphid species infesting untreated head lettuce in plots planted at various intervals during the growing season, Yuma Agricultural Center, 2002-2003.

Table 3. Population abundance of apterous (non-winged) aphids colonizing untreated lettuce and associated weather conditions, Yuma Agricultural Center, 1999-2003.

Growing Season	Planting date	Harvest date	Lettuce Variety	Temperature (ºF) Max	Min	Avg	Rain (in.)	Mean Apterous Aphids / Plant at Harvest: Green Aphid Complex Head	Green Aphid Complex Frame	Lettuce Aphid Head	Lettuce Aphid Frame	Foxglove Aphid Head	Foxglove Aphid Frame
1999-2000	11-Oct	24-Jan	*Grizzley*	*81*	48	64	0	0	0	0	0	0	0
	1-Nov	20-Feb	*Wolverine*	*75*	45	58	0.1	0	0	0	0	0	0
	15-Nov	1-Mar	*Del Rio*	*75*	45	59	0.1	1.3	0.6	12.3	0	0	0
	1-Dec	23-Mar	*Jackel*	*73*	44	60	0.3	0.3	0.3	8.2	0.5	0	0
	15-Dec	23-Mar	*Diamond*	*74*	45	60	0.3	0.2	0.1	42.9	0.6	0	0
2000-2001	11-Oct	25-Jan	*Grizzley*	*74*	50	61	1.2	2	14.4	0	0	0	0
	1-Nov	2-Mar	*Wolverine*	*70*	45	57	1.16	15.2	38.5	5.1	0	0	0
	15-Nov	3-Mar	*Del Rio*	*70*	44	56	1.12	8.5	42.6	6.5	0.9	0	0
	1-Dec	26-Mar	*Jackel*	*72*	46	58	2.9	2.6	12.9	9.6	0.4	0	0
	15-Dec	26-Mar	*Diamond*	*73*	47	59	2.9	0.3	3.0	8.2	0.6	0	0
2001-2002	10-Oct	14-Jan	*Wolverine*	*78*	49	63	0.1	0	0	0	0	0	0
	28-Oct	4-Feb	*Grizzley*	*72*	44	58	0	0	2.3	0	0	0.3	0
	15-Nov	5-Mar	*Wolverine*	*74*	44	58	0	0.5	7.1	0	0	0	0.1
	3-Dec	22-Mar	*Diamond*	*72*	41	57	0	3.6	7.9	1.1	0.1	11.7	2.9
	13-Dec	6-Apr	*Diamond*	*73*	42	57	0	1.0	1.5	6.3	0.4	1.4	6.3
2002-2003	10-Oct	14-Jan	*Wolverine*	*77*	47	59	0.03	0.4	3.5	0	0	0.5	3.4
	29-Oct	12-Feb	*Grizzley*	*74*	45	59	1.27	1.1	6.9	0	0	2.4	48.1
	14-Nov	9-Mar	*Bubba*	*73*	45	59	1.27	96.6	244.6	44.7	16.4	33.9	120.9
	3-Dec	18-Mar	*Diamond*	*73*	44	58	1.23	105.5	345.6	145.7	21.4	125.9	201.3
	12-Dec	18-Mar	*Diamond*	*74*	45	59	1.23	126.2	170.9	182.2	18.9	81.8	101.0

THE UNIVERSITY OF ARIZONA

Desert Vegetable Advisories

COLLEGE OF AGRICULTURE AND LIFE SCIENCES

The Desert Vegetable Advisories have started for the 2003-2004 season!

These informative advisories are written by John Palumbo, Research Scientist, stationed at the Yuma Agricultural Research Center. Their purpose is to address timely vegetable production issues. Each advisory includes a production update and pest management update, including data from Dr. Palumbo's sticky trap network. Along with a snapshot of production and pest management conditions, these advisories provide detailed management information on chronic and new insect pests affecting vegetable crops in our state.

These concise, user-friendly advisories are posted, approximately every two weeks on the Arizona Crop Information web Site (ACIS). Just go to:

http://cals.arizona.edu/crops/vegetables/

and click on the "Advisories" button.

If you'd like to be notified by e-mail when a new advisory is written, you can ask to be signed up on our ACIS Updates e-mail list. Approximately twice a month you will receive a short e-mail message which will inform you of any new information that has been added to the ACIS site, including the Desert Vegetable Advisories, and any upcoming events that may be of interest to you (including workshops where CEU's can be earned). If you would like to be added to this list just send an e-mail to jsjones@ag.arizona.edu requesting your addition.

Chemical Weed Control for Alfalfa in the Low Deserts of Arizona

Barry Tickes, University of Arizona

Herbicide	Rate lbs ai/A	Application	Summer Annual Grasses	Winter Annual Grasses	Sandbur	Shepherdspurse	Londonrocket	Common Lambsquarter	Nettleleaf Goosefoot	Little Mallow	Pigweed	Bermudagrass	Nutsedge	Comments
Balan	1.12 to 1.5	Preplant Incorporated	●	●	●	○	○	◗	◗	○	◗	○	○	Poor weed control may result where soil cracks & weeds emerge through cracks. Injury may result to alfalfa if stressed. Incorporate in 2 directions within 8 hours.
Eptam	2.0 to 3.0	Preplant Incorporated & Preemergence	◗	◗	●	○	○	◗	◗	◗	●	○	◗	This product has a short residual, which will require multiple applications for season long control. Application following 1^{st}, 3^{rd}, & 5^{th} cuttings is most common, with the ability to use up to 12 lbs. per season if needed. Use lowest label rates for preplant treatments when extreme temperatures may occur.
Trifluralin 10% Granules	1.0 to 2.0	Preemergence	●	●	●	○	○	◗	◗	○	●	○	○	Should be incorporated with irrigation within 3 days after application. Do not use in new seeded or reseeded alfalfa. Water ponding or high organic matter may reduce control.
Zorial	1.0 to 2.0	Preemergence	●	●	●	◗	◗	◗	◗	◗	◗	○	◗	Cannot apply for 5 months following planting. Will require more than 1 season for nutsedge control. Due to long residual do not apply during final year of stand. Product needs to contact soil so application following sheep or cutting, but before regrowth starts is optimum.
Kerb	0.5 to 2.0	Preemergence & early Postemergence	○	●	○	○	○	○	○	○	○	○	○	Label restricts the application of this herbicide to after the first trifoliate leaf stage of the alfalfa. Irrigation tends to move this herbicide below the germinating broadleaf weeds.
Sencor	0.375 to 0.5	Preemergence & early Postemergence	◗	●	◗	●	●	●	●	◗	●	○	○	Apply following winter or early spring grazing only to established alfalfa. Regrowth of alfalfa should not exceed 2 inches or unacceptable injury may occur. Do not apply to stressed alfalfa. Do not apply to reseeded alfalfa for at least 6 months following reseeding.
Gramoxone	0.25 to 0.5	Early Postemergence	◗	◗	◗	◗	●	●	●	◗	●	○	○	Do not apply if regrowth after grazing or cutting is more than 2 inches tall or unacceptable injury may occur. Do not graze or harvest within 60 days of application . Foliage present at time of application will be discolored or stunted. Do not use in seedling alfalfa. Contact activity only, will not control weeds that germinate following treatment.
Buctril	0.25 to 0.375	Postemergence	○	○	○	◗	●	●	●	◗	●	○	○	Alfalfa must have a least 2 trifoliate leaves. Do not apply when temperatures exceed 70°F at or within 3 days of application because unacceptable crop injury may occur. Contact activity only, will not control weeds that emerge following treatment.
2,4-DB Amine	0.5 to 1.5	Postemergence	○	○	○	○	●	●	●	○	●	○	○	To minimize crop injury, avoid applications when foliage does not cover the soil. Irrigation should be delayed as long as possible (10 days or more) following application. The addition of a non-phototoxic surfactant will improve weed control but may also increase injury.
Pursuit	0.047 to 0.094	Postemergence	○	◗	○	●	●	○	●	●	●	○	◗	Long soil residual activity, should not be used if rotation to a susceptible crop is possible within one or 2 years. Check label for restrictions. Some temporary stunting of alfalfa will occur after application. Weak on the composites and lambsquarter. Suppresses grasses. Apply when weeds are small.
Raptor	0.032 to 0.048	Postemergence	◗	◗	◗	●	●	◗	●	●	●	○	◗	Better than Pursuit on Lambsquarters, Sowthistle, Prickly Lettuce and grasses. Shorter soil residue than Pursuit.
Poast	0.1 to 0.5	Postemergence	●	●	◗	○	○	○	○	○	○	◗	○	Will not control annual bluegrass or sprangletop. Apply to actively growing grasses. Always add a non-phytotoxic oil concentrate. A second application will be required on perennial grasses when regrowth occurs or new plants emerge. Will only control weeds present at time of application and more than one application may be necessary to achieve season long annual grass control.
Select	0.094 to 0.25	Postemergence	●	●	◗	○	○	○	○	○	○	◗	○	Apply to actively growing grasses and use a non-phytotoxic oil concentrate. Will control both annual bluegrass and sprangletop.

● Good Control ◗ Partial Control ○ No Control

Rev. Nov 2003

CHEMICAL WEED CONTROL FOR WHEAT AND BARLEY IN THE LOW DESERTS OF ARIZONA

		Grasses				Mustard			Chenopodium			Composite		Other		Comments
Herbicide	**Rate (lb ai/A)**	**Canarygrass**	**Wildoat**	**Rabbitfoot Grass**	**Italian Ryegrass**	**London Rocket**	**Shepardspurse**	**Wild Mustard**	**Nettleleaf Goosefoot**	**Lambsquarter**	**Russian Thistle**	**Annual Sowthistle**	**Prickly Lettuce**	**Silversheath Knotweed**	**Little Mallow**	
Banvel 4S & Clarity 4S	0.06 to 0.12	❍	❍	❍	❍	●	●	●	●	●	●	●	◗	●	◗	Less crop safety than MCPA, 2,4-D & Buctril especially on barley. Should be applied prior to 5 leaf stage of growth. Drift Hazard. Tank mixes with other herbicides may increase potential crop injury.
2,4-D	0.25 to 0.50	❍	❍	❍	❍	●	●	●	●	●	●	●	●	◗	◗	Drift Hazard to a wide range of broadleaf crops. Should be applied after tillering & before boot stage of growth. Tank mixes with other herbicides may increase potential of crop injury.
MCPA	0.25 to 1.5	❍	❍	❍	❍	●	●	●	●	●	●	◗	●	◗	◗	Drift Hazard but safer to cotton & alfalfa than 2,4-D. Apply after tillering & before boot stage. Tank mixes will increase potential crop injury.
Buctril 2E	0.25 to 0.375	❍	❍	❍	❍	●	●	●	●	●	●	●	●	❍	❍	This is a contact herbicide & will only control small weeds. Less drift hazard. Can be applied from emergence to boot stage of crop development.
Aim 2E	0.008 to 0.016	❍	❍	❍	❍	❍	◗	●	◗	◗	◗	◗	❍	◗	●	Contact herbicide with little or no residual activity. Good coverage to actively growing weeds essential.
Achieve 40DG	0.18 to 0.24	●	●	✱	●	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	Best weed control will result if applied after most of the weeds have emerged and the largest ones are no more than 4 to 7 leaves.
Hoelon 3E	0.75 to 1.0	◗	●	❍	●	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	Canarygrass with 3 or more leaves will not be controlled. Crop oil will improve control but may increase temporary crop injury.
Avenge 2S	0.625 to 1.0	❍	●	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	May cause unacceptable crop injury to durum & other wheat varieties. Will control wild oat up to 5 leaf stage. Resistance of wild oats has been noted in several Western states.
Stinger 3E	0.1 to 0.125	❍	❍	❍	❍	❍	❍	❍	❍	❍	◗	●	●	❍	❍	Avoid drift to sensitive crops. Apply from 3 leaf to boot stage of crop.

● Good Control ◗ Partial Control ❍ No Control ✱ Too little local data to evaluate.

Evaluation of Products to Manage *Sclerotinia* Leaf Drop of Lettuce in 2003

Michael E. Matheron and Martin Porchas

Abstract

Sclerotinia leaf drop in Arizona is caused by two soil-borne fungi, Sclerotinia minor and S. sclerotiorum. Moist soil and moderate temperature favor this disease. Some registered products as well as new chemistries in development were evaluated for control of leaf drop on lettuce during the winter vegetable growing season in 2002-2003. Sclerotia of each pathogen were applied to plots after lettuce thinning and just before the first application of test compounds. In plots infested with Sclerotinia minor, all materials tested at an appropriate rate significantly reduced disease. The best treatments included an application of Contans followed by an application of Endura (BAS 510), as well as two applications of an experimental compound or the standard materials Ronilan and Rovral. Other useful products included Endura, Serenade, Pristine (BAS 516), Botran, Switch and Contans. In plots infested with S. sclerotiorum, two applications of Contans provided the best level of disease reduction among tested materials. Three applications of Endura or Pristine also were very efficacious. Other compounds that provided some reduction in disease caused by S. sclerotiorum included Botran, Serenade and Switch. Two of the products tested, Contans and Serenade, are biological control materials. For a valid comparison of products for control of Sclerotinia drop of lettuce, it is important to compare the results obtained from more than one field study. The reader is urged to review previous studies in addition to this report to get a true picture of the relative efficacy of tested compounds for control of Sclerotinia drop.

Introduction

Sclerotinia minor and *S. sclerotiorum* are two soil-borne fungi that cause lettuce drop in Arizona. As with other fungal diseases of vegetable crops, environmental conditions govern disease development. Mild to moderate temperatures and moist soil conditions favor lettuce drop; therefore, the incidence of the disease normally is highest from December through March in western Arizona lettuce fields. To minimize the occurrence of Sclerotinia drop, a fungicide treatment can be applied to lettuce beds immediately after thinning when plants are very small. This fungicide application, which can be followed in about 3 weeks by another treatment, forms a chemical barrier between the soil and the developing leaf canopy of the lettuce plant. With this chemical barrier in place, the bottom leaves and stem of each lettuce plant will be protected from colonization by the germinating sclerotia of the pathogens.

Timely application of an effective fungicide is a critical component of an overall disease management strategy when lettuce is planted in fields with a history of drop. Some new agrochemicals are in development that have activity on the group of plant pathogens that includes *Sclerotinia*. Two other products are biological disease control materials; Serenade contains a bacterium and Contans consists of a fungus. A field trial was initiated during the 2002-2003 vegetable season to test the potential efficacy of these new products on Sclerotinia drop of lettuce.

This is a part of the 2003 Vegetable Report, The University of Arizona College of Agriculture and Life Sciences, index at http://ag.arizona.edu/pubs/crops/az1323

Materials and Methods

This study was conducted at the Yuma Valley Agricultural Center. The soil was a silty clay loam (7-56-37 sand-silt-clay, pH 7.2, O.M. 0.7%). Sclerotia of *Sclerotinia minor* were produced in 0.25-pt glass flasks containing 15 to 20 sterilized 0.5 in. cubes of potato by seeding the potato tissue with mycelia of the fungus. After incubation for 4 to 6 weeks at 68°F, mature sclerotia were separated from residual potato tissue by washing the contents of each flask in running tap water within a soil sieve. Sclerotia were air-dried at room temperature, then stored at 40°F until needed. Inoculum of *Sclerotinia sclerotiorum* was produced in 2-qt glass containers by seeding moist sterilized barley seeds with mycelia of the pathogen. After a 2 month incubation at 68°F, abundant sclerotia were formed. The contents of each container were then removed, spread onto a clean surface and air-dried. The resultant mixture of sclerotia and infested barley seed was used as inoculum. Lettuce 'Winterhaven' was seeded and watered October 29, 2002 on double rows 12 in. apart on beds with 40 in. between bed centers. Treatments were replicated five times in a randomized complete block design. Each replicate consisted of 25 ft of bed, which contained two 25 ft rows of lettuce. Plants were thinned November 23 at the 3-4 leaf stage to a 12 in. spacing. After thinning, for plots infested with *Sclerotinia minor*, 0.13 oz (3.6 grams) of sclerotia were distributed evenly on the surface of each 25-ft-long plot between the rows of lettuce and incorporated into the top 1-inch of soil. For plots infested with *Sclerotinia sclerotiorum*, 0.5 pint of a dried mixture of sclerotia and infested barley grain was broadcast evenly over the surface of each 25-ft-long lettuce plot, again between the rows of lettuce on each bed, and incorporated into the top 1-inch of soil. Sclerotia were applied to plots on December 11. Treatment beds were separated by single non-treated beds. Treatments were applied with a tractor-mounted boom sprayer (flat-fan nozzles spaced 12 in. apart) that delivered 50 gal/acre at 100 psi. Test materials were applied to the surface of the bed and plants at the times described in the data table. Mean soil temperature (°F) at the 4 in. depth was as follows: Dec, 54; Jan, 56; Feb, 58. Total rainfall in inches was as follows: December, 0.00; January, 0.03, February, 0.57. Furrow irrigation was used for the duration of this trial. The severity of disease was determined at plant maturity (Feb 24) by recording the number of dead plants in each plot. As a point of reference, the original stand of lettuce was thinned to approximately 55 plants per plot.

Results and Discussion

In plots infested with *Sclerotinia minor*, all materials tested at an appropriate rate significantly reduced disease. The best treatments included an application of Contans followed by an application of Endura (BAS 510), as well as two applications of an experimental compound or the standard materials Ronilan and Rovral. Other useful compounds included Endura, Serenade, Pristine (BAS 516), Botran, Switch and Contans. In plots infested with *S. sclerotiorum*, two applications of Contans provided the best level of disease reduction among tested materials. Three applications of Endura or Pristine also were very efficacious. Other compounds that provided some reduction in disease caused by *S. sclerotiorum* included Botran, Serenade and Switch. Two of the products tested, Contans and Serenade, are biological control materials. Contans is a strain of the fungus *Coniothyrium minitans* and Serenade is a strain of the bacterium *Bacillus subtilis*.

For a valid comparison of products for control of Sclerotinia drop of lettuce, it is important to compare the results obtained from more than one field study. The reader is urged to review previous studies in addition to this report to get a true picture of the relative efficacy of compounds for control of Sclerotinia drop.

Sclerotinia drop of lettuce fungicide trial, 2003.

Michael Matheron and Martin Porchas, Yuma Agricultural Center, University of Arizona.

Treatment	Rate (lb a.i./A)	Treatment dates [1]	Diseased plants per 25 ft plot[2]	
			S. minor	*S. sclerotiorum*
Contans (water incorporation)[3]	4.0 lb prod.	1		
alternated with BAS 510 70WG	0.45	3	4.4	30.2
Rovral 4F	1.0	1,3	6.4	29.2
Ronilan 50DF	1.0	1,3	9.8	21.2
Endura 70WG (BAS 510)	0.35	1,2,3	10.0	16.6
Serenade AS (water incorp.)[3]	4.0 qt prod.	1,3	10.0	27.4
Pristine 38WG (BAS 516)	0.4	1,3	10.2	27.8
Botran 5F	1.87	1,3	10.8	24.6
Endura 70WG (BAS 510)	0.45	1,2,3	11.0	17.2
Pristine 38WG (BAS 516)	0.45	1,2,3	11.0	19.8
Botran 5F	3.75	1,3	11.0	28.2
Switch 62.5WG	0.43	1,3	11.6	27.6
Endura 70WG (BAS 510)	0.35	1,3	11.8	37.2
Switch 62.5 WG	0.56	1,3	12.4	30.0
Contans (water incorporation)[3]	4.0 lb prod.	1,3	12.6	12.8
Contans (water incorporation)[3]	2.0 lb prod.	1,3	16.8	18.2
Non-treated control	-------	-------	23.2	37.8
LSD (Least Significant Difference, *P*=0.05) [4]			5.0	8.4

1 Treatments were applied to soil on 1) Dec 12; 2) Dec 20; 3) Dec 31, 2002.

2 Disease assessment was performed at crop maturity on Feb 24, 2003. Each 25 ft. plot contained approximately 55 plants. All diseased plants were dead or dying.

3 Product applied to bed surface between lettuce rows in 1.0 gal of water per plot. An additional 1.0 gal of water was applied to further incorporate the product into the soil.

4 Values in each column differing by more than the least significant difference are significantly different from each other according to the Duncan-Waller K-ratio test.