Final Report to the California Department of Pesticide Regulation
Project Year 1997-98

Principal Investigator: Dr. Michael J. Costello, University of California Cooperative Extension, 1720 South Maple Avenue, Fresno, CA 93702. Ph. (209) 456-7567, e-mail mjcostello@ucdavis.edu.

Project Title: Biologically Integrated Vineyard Systems in the Central San Joaquin Valley

Summary: In California, there is an effort underway among farmers, consumers, private consultants, regulatory agencies, and UC researchers and extension advisors to implement production practices which incorporate the concepts of integrated pest and fertility management. These efforts were started by groups such as the California Clean Growers and have been refined by the Biologically Integrated Orchard Systems (BIOS). The "biologically integrated vineyard systems" or (BIVS) is based on the BIOS model developed in almond orchards in Merced County. BIVS was established to encourage implementation of production practices which replace inputs that are either disruptive to nontarget organisms or have been found to be sources of off-site contamination.

The BIVS program began in the fall of 1995 with 11 growers who committed all or part of their acreage to the program. Currently, there are 23 growers with approximately 456 acres in the program, many growers interested in enrolling in the program, and a mailing list of 62 growers, PCA's, and industry representatives. BIVS provides a support network to growers and industry leaders by holding monthly breakfast meetings. Here, participants have an opportunity to discuss current vineyard management issues and events that might aid them in decision making. BIVS has an advisory team (management team) consisting of a UC farm advisor, a CSU Fresno professor, an independent pest management advisor, and a grower. In addition, an adjunct technical advisory group consists of UC specialists in weed science and viticulture. Each grower participant has already met or is meeting soon with two to three members of the advisory team to discuss results of the previous season and revise/improve his/her current management practices. BIVS acreage was monitored weekly from May through August of 1997 for leafhoppers, mites, and omnivorous leafroller. These data aided growers in the management of these pests. BIVS vineyards were also surveyed mid-season for weeds and the fungus powdery mildew. Four field days were sponsored by BIVS in 1997: two weeds field days, a spray technology demonstration day, and a mite management and identification day.

Objectives:

Maintain a network of growers and PCAs in the central San Joaquin Valley committed to implementing the BIVS program. In two years, the BIVS program has grown from 11 to 23 growers. Another 25 growers have committed acreage to the program for 1998, and the mailing list has expanded to 62 growers, PCAs and other industry representatives. Since this objective is ongoing, regular meetings and periodic field days are held to inform growers about the program. Many of these activities have been documented by journalists and publicized in various trade journals. This press coverage, along with our annual solicitations for new grower members and

word of mouth, has generated increased interest in the program. Participation in the program has doubled in each year of its existence.

Review/revise guidelines and goals for each grower participant. All growers are familiar with the goals of the program of implementing safe, environmentally sound, and profitable farming systems. With this information, each grower met with the advisory team in the winter of 1997/98 to develop or refine a set of customized biologically integrated management practices. These goals are designed to help them make farm management decisions in the upcoming season. Growers designate a portion or all of their vineyards (from 5-85 acres) to be managed under BIVS guidelines. New growers meet with the advisory team on farm to lay the groundwork for participation in the program. Veteran growers meet with the advisory team in groups of three or four to review and revise the individual management practices they have been ~~used over~~ using during the past year.

Provide a forum for discussion of issues pertaining to program guidelines and the exchange of ideas. This is done through monthly breakfast meetings where various issues are discussed, management ideas are exchanged, and support for incipient programs is given. Agenda ~~t~~items at these meetings usually consist of a discussion on current vineyard management events such as cover cropping, fertilization, or pest management, in addition to a presentation from an advisory team member or invited guest.

Pesticide usage and monitoring of BIVS acreage

Table 1 lists the pounds of pesticide active ingredient (ai) applied historically on BIVS acreage or on an equivalent amount of conventional acreage and compares it with pesticide use on BIVS acreage in 1997. Pesticides are categorized as insecticides and nematicides or herbicides. Fungicide use was not catalogued. Four insecticides/nematicides (fenamiphos, endosulfan, methomyl and phosmet), which are in the high risk category (organophosphates, carbamates and chlorinated hydrocarbons) were eliminated altogether. One grower used carbaryl (a carbamate) and dibrom (an organophosphate). Propargite (a B-2 carcinogen) use decreased by 87%, cryolite use decreased by 13% and Bt use remained the same. The use of oil (used as a substitute for propargite) increased from zero to 125 gallons, and the use of imidacloprid (used as a substitute for several high risk materials) increased 51%. Pre-emergent herbicide use decreased across the board: simazine by 65%, norflurazon by 11%, oxyfluorfen by 95%, oryzalin by 94% and diuron by 56%. Paraquat dichloride use was eliminated, whereas glyphosate use remained about the same.

Weekly monitoring of BIVS acreage began in mid-May for leafhoppers, mites, and OLR. All samples were taken from vines transected by randomly selected coordinates of the vineyard. Leafhoppers and mites were counted on 30 leaves per vineyard. Only 57% of BIVS growers treated for leafhoppers in 1997 (Table 2). Two of these treated with oil, and the remainder with imidacloprid; both of these are considered low risk materials. 15% of BIVS growers treated for mites, and half of these used oil (Table 3). Two other growers released predator mites for spider mite control, and as a result did not apply any chemicals. OLR was sampled by inspecting 100 bunches per vineyard for pupae, larvae, and pupal cases. 58% of BIVS growers did not treat for

OLR at all (Table 4), and those that did timed their treatments to the degree day model. Only one grower treated for a late season OLR infestation. At mid-season, weed diversity was estimated from 50 quadrats per vineyard, and powdery mildew incidence/severity was estimated from 100 bunches per vineyard (Table 5). During harvest, berry weights and soluble solids were determined from 100 berries per site, and yields and quality were measured by counting/weighing raisin trays from five rows or harvesting wine grapes from 10 vines (Table 6).

quadrants

Pest Management

Pest management was highlighted at a number of the monthly meetings and field days in 1997. For example, at the June 3 meeting Walt Bentley, the UC Area Wide IPM Advisor, gave a presentation on managing spider mite populations in an efficient and environmentally sound manner. In July 1997, a mite field day was held to inform about 35 attendees on the results of two experiments being conducted by Dr. Michael Costello and Richard Coviello of UC Cooperative Extension. Independent Pest Control Advisor, Larry Whitted and Walt Bentley discussed cultural practices and spider mite management. At the end of the presentation, attendees were invited to tour the experimental plots and identify mites. During the season, copies of pest data were given to growers each week.

These are some of the efforts BIVS growers undertook in the 1996 and 1997 growing seasons to meet BIVS objectives:

- 17% have experimented with the use of soil amendments to combat nematode infestations.
- 13% used horticultural oil as an alternative to propargite for mites or leafhoppers.
- 48% used cultivation as an alternative to pre emergent herbicides for weed control.
- 13% used only contact herbicides as an alternative to pre emergent herbicides for weed control.
- 22% used lower rates of simazine or changed from simazine to another pre emergent that does not have the potential for groundwater contamination.
- 57% planted cover crops for improving soil, vine health, and pest management (nematodes and spider mites).
- 9% did not use any pesticides at all based on the BIVS monitoring.
- 9% used only wettable sulfur for powdery mildew as part of their spider mite management program.

Community Involvement:

The BIVS program interacts with groups that have similar goals to ours, including the Westside Biologically Integrated Farming Systems (BIFS) project, Lodi/Woodbridge BIFS project, the Kings River Conservation District project, and SunMaid Best Management Practices project. At the November 4, 1997 meeting, Cliff Ohmart, the program coordinator for the Lodi-Woodbridge Winegrape Commission, spoke about the BIFS program. It was a great opportunity for growers to see other programs with similar goals to BIVS. BIVS and SunMaid have established a weather monitoring network through the UC IPM Pestcast program, which will aid growers in timing treatments for key pests.

Table 1
BIVS Pesticide Use in 1997

GROWER	BIVS ACREAGE	POUNDS OF ACTIVE INGREDIENT PER APPLIED ACRE OF INSECTICIDES/NEMATICIDES HISTORICALLY APPLIED	POUNDS OF ACTIVE INDREDIENT PER APPLIED ACRE OF INSECTICIDES/NEMATICIDES APPLIED ON BIVS ACREAGE IN 1997	POUNDS OF ACTIVE INDREDIENT PER APPLIED ACRE OF HERBICIDES HISTORICALLY APPLIED	POUNDS OF ACTIVE INDREDIENT PER APPLIED ACRE OF HERBICIDES ON BIVS ACREAGE IN 1997
ALLRED	20	1.8 LB/AC PROPARGITE-M&L 5.8 LB/AC CRYOLITE-O	.59 LB/AC DIBROM-O&L 1.3 LB/AC CARBARYL-O 5.8 LB/AC CRYOLITE-O	2.4 LB/AC NORFLURAZON	.96 LB/AC GLYPHOSATE (SPOT SPRAYED 10 ACRES .96 LB/AC GLYPHOSATE (10 ACRES)
BENNETT	10	1.8 LB/AC PROPARGITE-M & L	.38 OZ/AC IMIDACLOPRID-L	2.4 LB/AC NORFLURAZON .26 LB/AC OXYFLU0RFEN .96 LB/AC GLYPHOSATE	2.4 LB/AC NORFLURAZON 3.2 LB/AC DIURON .96 LB/AC GLYPHOSATE
BISHEL	54	0	0	0	0
BOREN	10	1.8 LB/AC PROPARGITE-M 1.5 LB/AC PROPARGITE-M 5.8 LB/AC CRYOLITE-O	2.1 LB/AC PROPARGITE-M (EVERY OTHER ROW) 5 LB/AC PROPARGITE-M 5.8 LB/AC CRYOLITE-O	.96 LB/AC GLYPHOSATE 2.7 LB/AC SIMAZINE .26 LB/AC OXYFLUORFEN	.96 LB/AC GLYPHOSATE (SPOT SPRAYED)
CAMPBELL	32	1.8 LB/AC PROPARGITE-M 5.8 LB/AC CRYOLITE-O	3 GAL/AC OIL-M 5.8 LB/AC CRYOLITE-O	.96 LB/AC GLYPHOSATE	.96 LB/AC GLYPHOSATE
CHOOLJIAN	40	.75 OZ/AC IMIDACLOPRID-L	1 1/4 GAL/AC OIL-L	2.7 LB/AC SIMAZINE	1.4 LB/AC SIMAZINE
CROSNO	8	1.5 LB/AC PROPARGITE-M&L 1.5 LB/AC PROPARGITE-M&L	1.5 LB/AC PROPARGITE-M&L 1.5 LB/AC PROPARGITE-M&L	.96 LB/AC GLYPHOSATE	.96 LB/AC GLYPHOSATE
FEAVER	10	1.8 LB/AC PROPARGITE-M 5.8 LB/AC CRYOLITE-O	1.2 LB/AC PROPARGITE-M 4.8 LB/AC CRYOLITE-O	.96 LB/AC GLYPHOSATE .11 LB/AC OXYFLUORFEN	.96 LB/AC GLYPHOSATE
FELKER	7	0	0	0	0
FORBES	20	1.8 LB/AC PROPARGITE-M 1.25 LB/AC ENDOSULFAN-L .08 LB/AC FENAMIPHOS-N 5.8 LB/AC CRYOLITE	.75 OZ/AC IMIDACLOPRID-L	.45 LB/AC SIMAZINE .96 LB/AC GLYPHOSATE	.45 LB/AC SIMAZINE .96 LB/AC GLYPHOSATE
FUJIOKA	18	0	0	0	0
HARPER	8	1.8 LB/AC PROPARGITE-M	0	1.4 LB/AC GLYPHOSATE .06 LB/AC OXYFLUORFEN	2.4 LB/AC GLYPHOSATE .06 LB/AC OXYFLUORFEN

Table 1, con't

GROWER	BIVS ACREAGE	POUNDS OF ACTIVE INGREDIENT PER APPLIED ACRE OF INSECTICIDES/NEMATICIDES HISTORICALLY APPLIED	POUNDS OF ACTIVE INDREDIENT PER APPLIED ACRE OF INSECTICIDES/NEMATICIDES APPLIED ON BIVS ACREAGE IN 1997	POUNDS OF ACTIVE INDREDIENT PER APPLIED ACRE OF HERBICIDES HISTORICALLY APPLIED	POUNDS OF ACTIVE INDREDIENT PER APPLIED ACRE OF HERBICIDES ON BIVS ACREAGE IN 1997
JUE	30	1.8 LB/AC PROPARGITE-M	0	.96 LB/AC GLYPHOSATE 2.9 LB/AC ORYZALIN 2.4 LB/AC DIURON 2.7 LB/AC SIMAZINE	0
KANGAS	4	1.8 LB/AC PROPARGITE-L 5.8 LB/AC CRYOLITE-O .08 LB/AC FENAMIPHOS-N	.38 OZ/AC IMIDACLOPRID-L 5.8 LB/AC CRYOLITE-O	1.9 LB/AC GLYPHOSATE 4 LB/AC ORYZALIN	1.9 LB/AC GLYPHOSATE 4 LB/AC ORYZALIN
KHASIGIAN	10	1.8 LB/AC PROPARGITE-M	0	1.4 LB/AC SIMAZINE .48 LB/AC GLYPHOSATE	2.4 LB/AC NORFLURAZON
LIGHTNER	10	0	0	0	0
LOEWEN	15	0	0	.48 LB/AC GLYPHOSATE	.48 LB/AC GLYPHOSATE
MEISNER	20	6.8 LB/AC CRYOLITE-O .045 LB/AC Bt-O .53 OZ/AC IMIDACLOPRID-L	6.8 LB/AC CRYOLITE-O .045 LB/AC Bt-O .53 OZ/AC IMIDACLOPRID-L	2.7 LB/AC SIMAZINE	1.4 LB/AC SIMAZINE .79 LB/AC NORFLURAZON .96 LB/AC GLYPHOSATE
SEIBERT	20	1.8 LB/AC PROPARGITE-M .75 OZ/AC IMIDACLOPRID-L	2.25 GAL/AC OIL-M 1.5 GAL/AC OIL-L	.9 LB/AC SIMAZINE 4 LB/AC ORYZALIN .96 LB/AC GLYPHOSATE	0
SMITH	85	0	0	.96 LB/AC GLYPHOSATE	.96 LB/AC GLYPHOSATE
TOPJIAN	53 1/2	1.5 LB/AC PROPARGITE-L	.28 OZ/AC IMIDACLOPRID-L	.96 LB/AC GLYPHOSATE	.96 LB/AC GLYPHOSATE
TUFENKJIAN	20	1.25 LB/AC ENDOSULFAN-L .68 LB/AC METHOMYL-L 5.8 LB/AC CRYOLITE-O	.75 OZ/AC IMIDACLOPRID-L 5.8 LB/AC CRYOLITE-O	1.6 LB/AC OXYFLUORFEN 3.1 LB/AC ORYZALIN .91 LB/AC PARAQUAT DICHLORIDE	.96 LB/AC GLYPHOSATE
VAN GUNDY	31.5	1.8 LB/AC PROPARGITE-L&M 5.8 LB/AC CRYOLITE-O 1 LB/AC PHOSMET-O .08 LB/AC FENAMIPHOS-N	.64 OZ/AC IMIDACLOPRID-L 5.8 LB/AC CRYOLITE	.42 LB/AC GLYPHOSATE 2.7 LB/AC SIMAZINE	.42 LB/AC GLYPHOSATE .17 LB/AC OXYFLUORFEN .9 LB/AC SIMAZINE
VASQUEZ	10	0	.38 OZ/AC IMIDACLOPRID-L	2.7 LB/AC SIMAZINE .96 LB/AC GLYPHOSATE	2.7 LB/AC SIMAZINE
WULF	10	0	0	.96 LB/AC GLYPHOSATE	.96 LB/AC GLYPHOSATE

Table 1, con't

TOTAL NUMBER OF ACRES	TOTAL LB/AC OF INSECTICIDES/NEMATICIDES HISTORICALLY APPLIED	TOTAL LB/AC OF INSECTICIDES/NEMATICIDES APPLIED ON BIVS ACREAGE	TOTAL LB/AC OF HERBICIDES HISTORICALLY APPLIED	TOTAL LB/AC OF HERBICIDES APPLIED ON BIVS ACREAGE
556	991.5 LBS CRYOLITE	865.5 LBS CRYOLITE	330.6 LBS GLYPHOSATE	333.8 LBS GLYPHOSATE
	489.2 LBS PROPARGITE	62 LBS PROPARGITE	423.1 LBS SIMAZINE	148.4 LBS SIMAZINE
	3.5 LBS IMIDACLOPRID	5.3 LBS IMIDACLOPRID	72 LBS NORFLURAZON	63.8 LBS NORFLURAZON
	4.4 LBS FENAMIPHOS	0 LBS FENAMIPHOS	95.5 LBS OXYFLUORFEN	5.9 LBS OXYFLUORFEN
	.9 LBS Bt	.9 LBS Bt	245 LBS ORYZALIN	16 LBS ORYZALIN
	50 LBS ENDOSULFAN	0 LBS ENDOSULFAN	18.2 LBS PARAQUAT DICHLORIDE	0 LBS PARAQUAT DICHLORIDE
	13.6 LBS METHOMYL	0 LBS METHOMYL	72 LBS DIURON	32 LBS DIURON
	31.5 LBS PHOSMET	0 LBS PHOSMET		
	O LBS CARBARYL	26 LBS CARBARYL		
	0 GAL OIL	125 GAL OIL		
	0 LBS DIBROM	11.8 LBS DIBROM		

KEY PESTICIDE USED FOR:
OMNIVOROUS LEAFROLLER-O
MITES-M
LEAFHOPPERS-L
NEMATODES-N

Table 2
BIVS Variegated Leafhopper Population 1997
Average number of nymphs/leaf

Grower	May 5	May 12	May 19	May 26	June 2	June 9	June 16	June 23	June 30	July 7	July 14	July 21	July 28	August 4	August 11	Materials Used
Allred	2.4	2.7	3.9	.6	1.8	1.4	.13	4.9	7.8	0	23.9	22.7	0	0	.17	Dibrom @ 1 pt/ac July 30 Sevin @ 2 lb/ac July 30
Bennett	30.1	33.6	19.1	2.8	2	.53	8.4	48.4	.63	0	0	.43	0	0	.03	Provado @ 1 oz/ac June 27
Bishel	n/a	1.2	14.1	.53	.47		.33	1.6	2.1	.6	.53	5.3	2.2	.33	.13	None
Boren	0.14	.67	.3	0	.1	0	0	0	0	0					0	None
Campbell	2.7	.25	6.3	0	.2	.1	0	.23	1.6	.13	3.9	2.1	.97	1.5	.1	None
Chooljian untreated	13	29.8	36.3	14.5	9.5	1.7	4.1	43.8	28.1	29	34.1	17.4	7.4	n/a	9.6	None
Chooljian treated	"	"	"	"	"	"	"	"	27.1	.43	3.4	2.1	.67	n/a	3	Trilogy (oil) July 3
Crosno	1.5	1.4	17.6	1.2	0	0	.17	.07	.1	n/a	n/a	n/a	n/a	0	0	Omite @ 5 lb/ac May 24 & July 7
Feaver	8.23	26.3	20.8	4.6	4.2	3.6	1.8	n/a	n/a	n/a	n/a	n/a	4.2	0	1	Omite @ 4 lb/ac June 18
Felker	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	None
Forbes low N	20.6	4.6	32.9	8.8	2.1	2.1	1.5	.87	.2	.8	.67	1.1	0	0	0	Provado June 21
Forbes high N	n/a	n/a	n/a	n/a	8.6	2	2.1	.21	1.4	1.3	3.3	.47	0	0	.13	Provado June 21
Fujioka	2.1	3.3	2	.4	.17	.07	.03	.2	2.2	1.5	.27	1.6	1.1	.27	.3	None
Harper	1	3.5	6.6	.83	.67	.03	.8	10.9	9.4	.17	.37	.13	0	.07		Provado @ .4 oz/ac July 3
Jue	0	0	.23	.1	.1	.17		.03	.1	.5	1.4	.27	.03	0	.33	None
Kangas	.57	11.2	13.6	15.4	1.4	.6	2.8	13.2	7.6	20	0	.17	.17	.07		Provado @ .5 oz/ac July 11
Khasigian	1.8	1.4	2.1	1	.4	0	.4	1.7	2.9	.1	1.3	.53	.03	0	0	None
Lightner	n/a	11.2	17.6	.5	.13	.03	.47	.4	.97	1.3	.53	.4	.83	.4	.7	None
Loewen	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	None
Meisner	1.8	2	.43	1.1	1.4	1.1	.77	.1	9.9	3.8	10.8	14.1	0	0	.77	Provado @ .71 oz/ac July 28
Seibert	3.8	4.5	14.8	4.9		1				17.5		19	11.6	12.3	40	Unipar (oil) August 12 & 29
Smith	.43	.87	3	1.7	.5	.83	.97	.17	2.1	2	2.8	3	6.4	1.7	2.3	None
Topjian	8.6	14	6.9	11.2	1.2	1.4	1.2	.47	17.4	18.9	17.3	8.9	4.2	0	.13	Provado @ .75 oz/ac July 1(every other row)

Table 2, con't

Grower	May 5	May 12	May 19	May 26	June 2	June 9	June 16	June 23	June 30	July 7	July 14	July 21	July 28	August 4	August 11	Materials Used
Tufenkjian (Clovis)	n/a	n/a	5.7	1.9	.43	.4	1.9	12.3	13.6	18.5	.1	.27	0	0	.4	Provado @ 1 oz/ac July 11
Tufenkjian (Sanger)	10.7	19.1	14.2	11	0	0	0	.07	0	0	0	0	0	6	0	Provado @ 1 oz/ac June 1
VanGundy	4.2	15.1	5.9	4.3	1.7	1.4	3.1	14.3	27.5	32.8	26.2	0	0	.03	0	Provado @ .85 oz/ac July 22
Vasquez	15.2	22.4	26.4	10.9	5	1.9	2.8	9.7	33.2	31.9	19.8	15.2	18.6	4.2	0	Provado date n/a
Wulf	0	6.1	6.1	2.2	.2	n/a	.23	.33	.33	2.2	.67	2.1	.7	1.1	.87	None

Table 3
BIVS Mite Infestation 1997
Average percent(%) of leaves with mites

Grower	May 5	May 12	May 19	May 26	June 2	June 9	June 16	June 23	June 30	July 7	July 14	July 21	July 28	August 4	August 11	Materials Used
Allred	0	0	0	0	0	0	0	0	17%	0	0	0	0	0	0	None
Bennett	0	5%	0	0	0	0	0	0	0	0	0	3	0	0	0	None
Bishel	n/a	0	0	0	0	n/a	0	0	3%	7%	10%	53%	10%	10%	6%	Predator mites
Boren	0	0	0	40%	27%	23%	23%	27%	17%	0	n/a	n/a	n/a	n/a	53%	Omite @ 7 lb/ac May 31 (every other row) & 5 lb/ac July 3
Campbell	0	0	0	0	0	0	0	20%	30%	87%	83%	70%	27%	7%	0	Saf-T-Side (oil) July 18
Chooljian	0	0	0	0	0	0	3%	7%	13%	3%	13%	7%	13%	3%	0	None
Crosno	0	3%	0	0	0	0	3%	13%	13%	n/a	n/a	n/a	n/a	0	0	None
Feaver	0	0	0	0	0	3%	7%	n/a	n/a	n/a	n/a	n/a	0	0	0	Omite @ 4 lb/ac June 18
Felker	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	None
Forbes	0	0	0	0	0	7%	7%	53%	7%	80%	87%	40%	13%	0	0	Water
Fujioka	0	0	0	0	0	7%	10%	43%	43%	47%	73%	43%	13%	0	0	Predator mites
Harper	0	3%	0	0	0	0	7%	0	3%	3%	13%	0	0	0		None
Jue	0	0	0	0	7%	3%	12%	13%	11%	10%	12%	21%	10%	6%	33%	None
Kangas	3%	0	0	10%	3%	10%	30%	3%	13%	7%	0	3%	%3	0		None
Khasigian	0	0	0	0	0	0	0	0	0	0	3%	0	0	0	0	None
Lightner	n/a	3%	0	0	0	0	0	10%	0	0	0	0	13%	0	3%	None
Loewen	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	None
Meisner	7%	7%	3%	0	0	0	0	0	23%	0	0	0	3%	0	0	None
Seibert treated	30%	47%	80%	97%	n/a	83%	60%	43%	50%	3%	0	0	0	0	0	Uni-par (oil) May 30
Smith	0	7%	0	0	0	0	0	7%	17%	20%	10%	7%	10%	0	0	None
Topjian	0	0	0	0	0	0	0	0	7%	7%	0	0	0	0	0	None
Tufenkjian (Clovis)	n/a	n/a	0	0	0	0	0	0	0	0	0	0	0	0	0	None
Tufenkjian (Sanger)	0	0	0	0	0	0	0	0	0	0	0	0	0	7%	0	None
VanGundy	3%	0	0	0	0	0	13%	17%	0	7%	10%	0	3%	0	0	None
Vasquez	0	0	0	0	0	0	0	17%	13%	3%	0	0	0	0	0	None
Wulf	0	0	0	3%	0	n/a	0	0	10%	7%	13%	0	17%	0	3%	None

Table 4
BIVS OLR Infestation 1997
Percent of clusters with omnivorous leafroller

Grower	May 5	May 12	May 19	May 26	June 2	June 9	June 16	June 23	June 30	July 7	July 14	July 21	July 28	August 4	August 11	Materials Used
Allred	0	1%	0	0	1%	0	0	3%	2%	1%	1%	0	0	1%	4%	Cryolite @ 6 lb/ac May 5 Dibrom @ 1 pt/ac July 30
Bennett	1%	0	5%	0	7%	1%	0	0	3%	0	0	0	0	3%	0	None
Bishel	n/a	0	0	0	0	n/a	0	0	0	0	0	1%	0	0	0	None
Boren	0	0	1%	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	1%	Cryolite @ 6 lb/ac April 29
Campbell	1%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Cryolite @ 6 lb/ac April 28
Chooljian	2%	4%	3%	0	1%	2%	3%	7%	3%	7%	13%	8%	6%	15%	11%	None
Crosno	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	1%	0	None
Feaver	6%	6%	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	0	0	0	Cryolite @ 5 lb/ac May 8 & June 18
Felker	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	None
Forbes	1%	0	2%	0	0	0	0	0	0	0	0	1%	0	0	0	Cryolite May 2
Fujioka	1%	5%	0	0	0	0	0	0	0	0	0	0	0	1%	0	Lacewings
Harper	7%	2%	3%	0	1%	0	0	0	0	0	0	0	0	0	0	Cryolite @ 6 lb/ac May 11
Jue untreated	0	n/a	n/a	n/a	0	0	n/a	0	0	0	2%	0	0	0	0	None
Jue treated	0	0	3%	0	0	0	n/a	0	1%	0	2%	0	0	0	1%	Cryolite @ 5 lb/ac April 26
Kangas	7%	1%	0	1%	0	0	4%	0	1%	1%	0	4%	14%	1%	n/a	Cryolite @ 6 lb/ac April 27
Khasigian	0	0	0	0	1%	0	0	0	1%	0	0	0	0	1%	0	n/a
Lightner	n/a	1%	1%	0	0	0	0	1%	2%	3%	2%	1%	1%	6%	0	n/a
Loewen	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	None

Table 4, con't

Grower	May 5	May 12	May 19	May 26	June 2	June 9	June 16	June 23	June 30	July 7	July 14	July 21	July 28	August 4	August 11	Materials Used
Meisner	5%	4%	6%	4%	2%	0	0	0	0	2%	0	1%	0	0	0	Cryolite @ 7 lb/ac April 27 Cryolite @ 7 lb/ac June 6 Javelin WG @ .8 lb/ac-July 12 Cryolite @ 6 lb/ac July 28
Seibert	0	0	0	0	n/a	0	0	0	0	0	0	0	0	0	1%	B.t. April 30
Smith	0	1%	1%	0	0	0	0	1%	0	0	0	0	0	1%	0	None
Topjian	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	None
Tufenkjian (Clovis)	n/a	n/a	0	0	0	0	0	0	0	0	0	0	0	0	0	None
Tufenkjian (Sanger)	0	0	0	0	0	0	0	0	0	1%	0	0	0	2%	12%	Cryolite @ 6 lb/ac May 10
VanGundy	0	0	0	0	0	0	1%	0	0	0	0	0	0	0	0	None
Vasquez	1%	0	1%	0	0	0	0	0	2%	0	0	1%	1%	0	0	None
Wulf	0	0	0	0	1%	n/a	0	0	0	0	0	1%	3%	1%	0	None

Wulf OLR Trial

	May 23	July 1	September 2
No Treatment	0	4%	0
Cryolite @ First Brood	0	2%	0
Cryolite @ First Brood & B.t. @ Second Brood	1%	6%	7%

Table 5
BIVS 1997 Powdery Mildew Monitoring

Grower	Average Percent Incidence	Average Percent Severity
Allred	5%	0.17%
Bennett	2%	0.06%
Bishel	68%	1.84%
Boren	n/a	n/a
Campbell	31%	3.23%
Chooljian	70%	9.9%
Crosno	n/a	n/a
Feaver	29%	0.79%
Felker	n/a	n/a
Forbes (high nitrogen)	72%	4%
Forbes (low nitrogen)	90%	14.94%
Fujioka	27%	1.91%
Harper	50%	1.95%
Jue	34%	3.09%
Kangas	72%	23.9%
Lightner/Kalar	n/a	n/a
Loewen	n/a	n/a
Meisner	8%	0.16%
Khasigian	35%	.85%
Seibert	46%	3.01%
Smith	88%	20.83%
Topjian	74%	8.06%
Tufenkjian (Clovis)	61%	3.58%
Tufenkjian (Sanger-Flames)	0%	0%
Van Gundy	10%	0.22%
Vasquez	0%	0%
Wulf	23%	0.81%

Percent Incidence is noted as a presence/absence factor for each cluster.
Percent Severity is expressed as a precent of infection for each cluster.

Table 6
BIVS Harvest 1997

Grower	Average tray count/acre(s)	Average tray weight (lbs)	Raisin tons/ac (unadj. for H2O)	Average green wt/vine (lbs)	Green tons/ac	Brix	Avg weight/berry (g)
Allred (Grenache)				42.48	10.13	22.3	2.5
Bennett						22.2	2.24
Bishel	913	5.44	2.48			20.0	2.29
Boren	1188	5.13	3.04			20.9	2.12
Campbell (oil)				42.86	10.22	22.0	1.92
Campbell (omite)				33.13	7.90	22.0	1.92
Chooljian	842	4.18	1.75			21.4	1.99
Crosno				n/a	n/a	21.2	1.84
Feaver	n/a	n/a	n/a			22.0	1.99
Felker	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Forbes (peach trees-high N)				33.04	9.99	23.8	2.21
Forbes (corner-low N)				39.54	11.96	23.2	2.33
Fujioka				41.83	9.98	22.4	2.13
Harper				44.28	12.53	19.1	1.91
Jue	n/a	n/a	n/a			18.6	1.78
Kangas				53.50	12.14	18.2	1.67
Lightner/Kalar				n/a	n/a	22.3	1.50
Loewen				n/a	n/a	23.0	2.01
Meisner				81.69	18.54	19.9	2.76
Khasigian (compost)	825	4.83	1.95			22.4	2.12
Khasigian (no compost)	811	4.83	1.95			22.5	2.11
Seibert	913	6.06	2.87			20.2	1.81
Smith	1039	4.70	2.43			21.8	2.25
Topjian	925	4.65	2.15			23.0	2.36
Tufenkjian (Clovis)				n/a	n/a	21.0	1.71
Tufenkjian (Sanger-Flames)				n/a	n/a	21.8	1.73
Van Gundy (row 95)	1130	4.52	2.51			21.0	2.08
Van Gundy (row 98)	1130	4.75	2.51			20.3	2.13
Van Gundy (row 101)	1130	4.71	2.74			20.2	2.10
Van Gundy (row 104)	1130	4.62	2.78			19.8	2.12
Vasquez				n/a	n/a	n/a	n/a
Wulf				35.66	8.5	22.1	1.93