

## Implementation

### Pesticide Use in Mating Disrupted Pear Orchards 2001-2005

Broc Zoller

The Pear Doctor, Inc., Kelseyville, California

**Keywords:** Mating disruption, insecticide use, codling moth (*Cydia pomonella*), forktailed bush katydid (*Scudderia furcata*), pear rust mite (*Epirimeris pyri*), pear leaf blister mite (*Phytopterus pyri*), pear slug (*Caliroa cerasi*), boxelder bug (*Leptocoris trivittatus*), western flower thrips (*Frankliniella occidentalis*), pear psylla (*Cacopsylla pyricola*), western spotted cucumber beetle (*Diabrotica undecimpunctata*), spider mites, other tortricid pests, pear.

**Abstract:** In the northcoast pear growing region of California during 2001-2005, codling moth was commercially managed by mating disruption supplemented with insecticides on 1200-1400 acres in Lake County and 700-850 acres in Mendocino County. Although insecticide use to supplement codling moth control did not increase during the period, pesticide use to control other pests has increased. Specific control costs for pear rust mite, pear leaf blister mite, forktailed bush katydid, pear slug, and other tortricid moths besides codling moth have all increased during the period. Foliar insecticide use to control boxelder bug has been significant in some years in some locations. A prebloom, preventative treatment approach for western flower thrips control has been used. Western spotted cucumber beetle has been an occasional minor pest requiring treatment.

## Introduction

Mating disruption (MD) for codling moth (CM) control has been used continuously on approximately 1,900 – 2,200 acres of pears located in the northcoast growing region (Lake and Mendocino Counties) of California during 2001 – 2005. It has been necessary to supplement CM control with insecticides in most orchards in the Lake County area, but less so in Mendocino County. The amount of supplemental control for CM has diminished, while control for some other pests, such as pear rust mite, pear leaf blister mite, pear slug, forktailed bush katydid and other tortricids has increased. This study of pesticide use in these orchards was undertaken to aid in determining future pest management direction.

## Methods

Pesticide use was compiled from treatments actually applied using pest control advisor recommendations and records. Seasonal average doses of chemicals applied during three treatment periods, (1) dormant through prebloom, (2) foliar and (3) postharvest, were computed for each county's acreage, by year. The foliar season was further divided in two by targeted pests, (1) pear psylla and mites or (2) worms and other pests. These dose tabulations were used to compute cost comparisons for the same years, using prices paid by one large grower in Lake County in 2005. These prices are listed in Table 3.

## Results and Discussions

Prebloom and dormant treatments have been decreasing slightly in Lake County and more in Mendocino County (Figures 3 and 4). Lorsban use for oblique banded leaf roller (*Choristoneura rosaceana*) (Oblr) in the delayed dormant spray has been reduced as Oblr-suppressing Confirm, Intrepid and Success foliar treatments for other pests have increased. Asana has been used as a preventative treatment for western flower thrips (Tables 1 and 2).

Foliar treatments for pear psylla and mites have been decreasing in Lake County but less so in Mendocino County (Figures 3 and 4). The use of foliar spray oils and Agrimek during the period accounts for this decline (Tables 1 and 2). The most significant changes in pesticide use have occurred in the foliar season for worms and other pests (Figures 3 and 4). The use of sprayable pheromones for other tortricids, and some treatments of Intrepid, Success and Assail applied for katydid, pear slug and other tortricids (with sometimes no CM pressure) account for this increase. Use of organophosphate materials, Guthion and Imidan, however, has been nearly eliminated. The application of Danitol, Dimethoate or Pyganic for box elder bug and sometimes western spotted cucumber beetle has been significant in some blocks in some years (Tables 1 and 2). These latter problems, although not increasing during 2001 – 2005, have appeared at far higher levels and in more blocks than prior to 2001. (Data are not included).

Postharvest treatments have been primarily for pear rust mite and pear leaf blister mite. These treatments increased significantly during the 2001- 2005 period (Figures 3 and 4). Diazinon plus 415 Oil and liquid lime sulfur and/or micronized sulfur have been used (Tables 1 and 2).

Costs per acre have generally paralleled the results cited above for pesticide use. However, postharvest pesticide use and costs in Lake County have risen faster than in Mendocino County, negating the cost savings in the reduction of Agrimek and oil use (Figures 1 and 2; Tables 4 and 5).

## Summary

Near elimination of organophosphate chemicals for CM has occurred in MD orchards. There are also decreases in costs for pear psylla and spider mite. However, an increasingly complex array of foliar and fruit pests other than CM has resulted in increased use of other, albeit softer, pesticides in these orchards. This new pest mix has resulted in net cost increases during 2001 – 2005.

**Table 1.** Pesticide use in mating disrupted orchards, Lake County

Lake County	Year		2001	2002	2003	2004	2005
	Mating Disruption Acres		1421	1379	1275	1236	1233
	Material	Full Dose	Doses per Acre				
DORMANT- Scale, Psylla,Oblr and Mites	Dorm Emulsive Oil, gal	12	1	1	1	1	1
	Lorsban 4e, pt	3	1	0.81	0.83	0	0.35
	415 Oil, gal	4	1	1	1	1	1
PREBLOOM- Thrips, Worms and Eriophyids	Asana XL, oz	14.5	0	0.49	0.5	0.5	0.5
	Liq Lime Sulfur, gal	5	0	0	0	0.18	0
	Micronized Sulfur, lb	15	0	0	0	0.17	0
FOLIAR- Psylla and Mites	Agrimek 0.15ec, oz	20	0.79	0.72	0.58	0.65	0.67
	Apollo/Savey, oz	4	0.01	0.02	0.01	0.05	0
	Acramite WS, lb	1	0	0.01	0.01	0.1	0.07
	415 Oil, gal	3	2.51	2.12	2.21	1.65	1.83
True Bugs, Worms and Cucumber Beetles	Danitol, oz	20	0	0.03	0.07	0.01	0.05
	Dimethoate 4ec, pt	1.5	0	0.07	0.04	0.01	0
	Pyganic,qt	1	0	0	0.02	0.01	0
Worms	Checkmate CM-F, oz	2.5	0	0	0.25	0.36	0.16
	Sprayable Phero, oz	1.32	0	0	0.26	0.91	1.37
Worms and Pear Slugs	Imidan 70wp, lb	7	0.06	0	0	0	0
	Guthion 50wp, lb	3	0.7	0.26	0.05	0.01	0.02
	Confirm 2F, oz	20	1.01	1.98	1.26	0	0
	Intrepid 2F, oz	16	0	0	1.11	1.29	1.18
Worms, Katydid and Pear Slugs	Success, oz	8	0	0	0	0	0.39
	Assail 70wp, oz	2	0	0	0	0.005	0.145
POSTHARVEST- Eriophyid Mites	415 Oil	5	0.22	0.02	0	0.28	0.01
	Diazinon 50wp, lb	2.5	0	0	0	0.26	0.01
	Liq Lime Sulfur, gal	10	0.16	0	0	0	0.96
	Micronized Sulfur, lb	25	0.37	0.32	0.79	0.33	0.77
<b>TOTAL DOSES</b>	Y= 8.41 + 0.325x; R= 0.64; P = 0.24		8.83	8.85	9.99	8.775	10.49

**Table 2.** Pesticide use in mating disrupted orchards, Mendocino County

Mendocino County	Year		2001	2002	2003	2004	2005
	Mating Disruption acres		756	752	726	710	846
	Material	Full Dose	Doses per Acre				
DORMANT-Scal, Psylla, Oblr and Mites	Dorm Emulsive Oil, gal	12	1	1	1	0.96	0.97
	Lorsban 4e, pt	3	1	0.83	0.83	0	0.44
	415 Oil, gal	4	1	1	1	1	1
PREBLOOM- Thrips, Worms and Eriophyids	Asana XL, oz	14.5	0.5	0.5	0.5	0.5	0.5
	Liq Lime Sulfur, gal	5	0	0	0	0	0
	Micronized Sulfur, lb	15	0	0	0	0	0
FOLIAR- Psylla and Mites	Agrimek 0.15ec, oz	20	0.79	0.56	0.45	0.57	0.55
	Apollo/Savey, oz	4	0.01	0	0	0.06	0
	Acramite WS, lb	1	0	0	0.28	0	0.12
	415 Oil, gal	3	1.56	1.84	1.72	1.54	1.57
True Bugs, Worms and Cucumber Beetles	Danitol, oz	20	0	0	0.05	0	0.02
	Dimethoate 4ec, pt	1.5	0	0	0	0	0
	Pyganic, qt	1	0	0	0	0	0
Worms	Checkmate CM-F, oz	2.5	0	0	0.14	0.17	0.11
	Sprayable Phero, oz	1.32	0	0.02	0.64	0.59	0.91
Worms and Pear Slugs	Imidan 70wp, lb	7	0	0	0	0	0
	Guthion 50wp, lb	3	0.22	0	0	0	0
	Confirm 2F, oz	20	1.13	1.69	0.81	0	0
	Intrepid 2F, oz	16	0	0	0.63	1.35	1.18
Worms, Katydid and Pear Slugs	Success, oz	8	0	0	0	0	0.36
	Assail 70wp, oz	2	0	0	0	0	0.17
POSTHARVEST- Eriophyid Mites	415 Oil	5	0	0	0	0.07	0.18
	Diazinon 50wp, lb	2.5	0	0	0	0	0.18
	Liq Lime Sulfur, gal	10	0	0	0	0	0.17
	Micronized Sulfur, lb	25	0	0	0	0	0.17
<b>TOTAL DOSES</b>	Y= 6.98 + 0.215x; R= 0.48; P= 0.41		7.21	7.44	8.05	6.81	8.6

**Table 3.** Pesticide prices used to compute costs, all years.

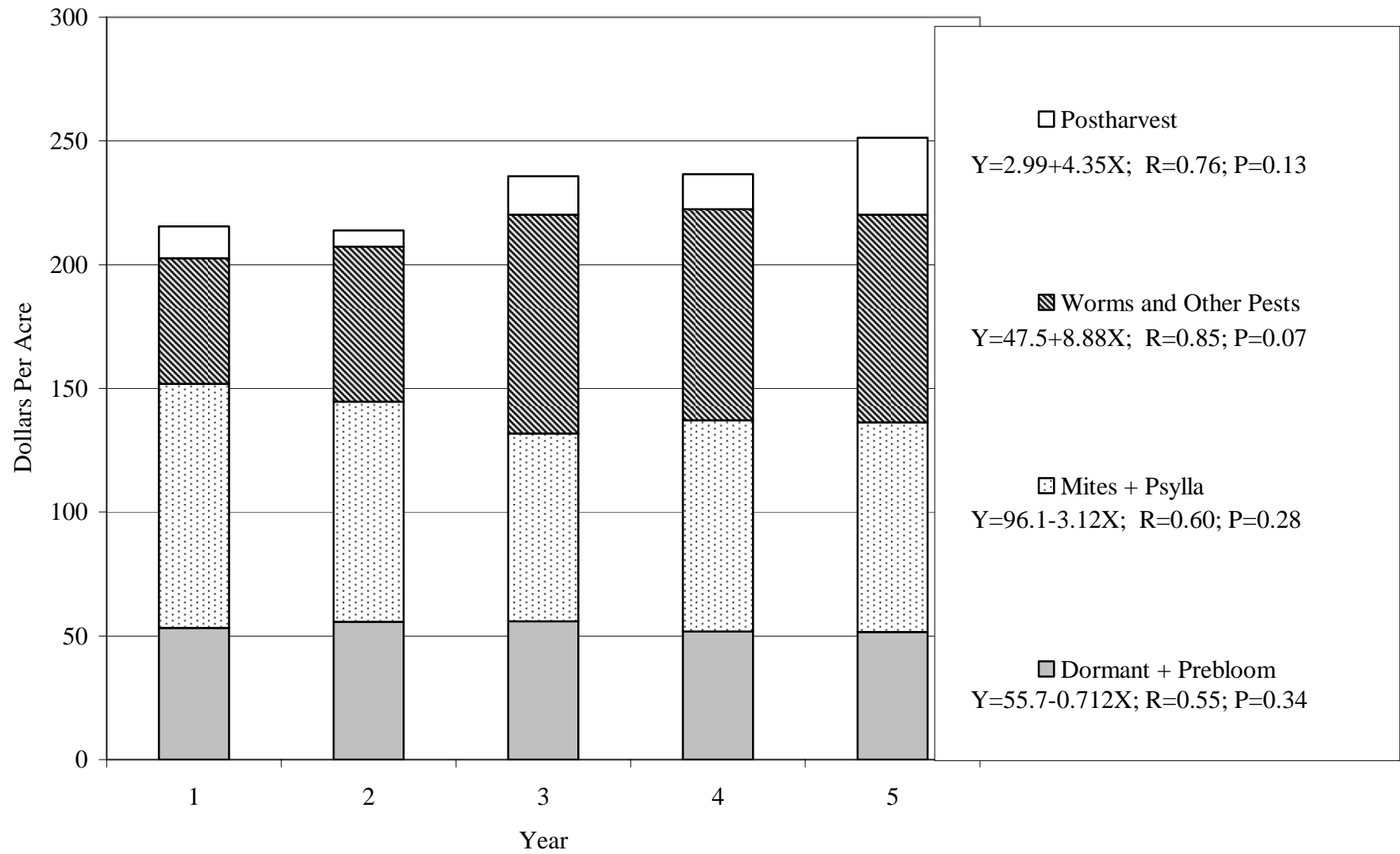
<b>Material</b>	<b>Unit</b>	<b>2005 Price</b>
Dorm Emulsive Oil	gal	\$ 2.73
Lorsban 4e	pt	3.03
Asana XL	oz	0.59
Liquid Lime Sulfur	gal	1.61
Micronized Sulfur 80%	lb	0.79
Agrimek 0.15ec	oz	4.83
Apollo Sc	oz	10.26
Acramite WS	lb	66.90
Danitol	oz	1.17
Dimethoate 4ec	pt	4.67
Pyganic	qt	110.53
Checkmate CM-F	oz	15.14
Checkmate OFM-F	oz	11.77
Imidan 70wp	lb	6.18
Guithion 50wp	lb	9.67
Confirm 2F	oz	1.37
Intrepid 2F	oz	1.94
Success	oz	4.76
Assail 70wp	oz	13.40
415 Oil	gal	2.82

**Table 4.** Pesticide costs in mating disrupted orchards, Lake County

Lake County	Year	2001	2002	2003	2004	2005
	Mating Disruption acres	1421	1379	1275	1236	1233
	Material	Dollars Per Acre at 2005 Prices				
DORMANT-Scale, Psylla, Oblr and Mites	Dorm Emulsive Oil, gal	\$32.76	\$32.76	\$32.76	\$32.76	\$32.76
	Lorsban 4e, pt	9.09	7.38	7.54	-	3.15
	415 Oil, gal	11.28	11.28	11.28	11.28	11.28
PREBLOOM-Thrips, Worms and Eriophyids	Asana XL, oz	-	4.19	4.26	4.28	4.28
	Liq Lime Sulfur, gal	-	-	-	1.42	-
	Micronized Sulfur, lb	-	-	-	2.07	-
FOLIAR-Psylla and Mites	Agrimek 0.15ec, oz	76.80	69.55	56.03	62.79	64.72
	Apollo/Savey, oz	0.62	0.82	0.62	1.85	-
	Acramite WS, lb	-	0.67	0.67	6.69	4.68
	415 Oil, gal	21.23	17.93	18.70	13.96	15.48
True Bugs, Worms and Cucumber Beetles	Danitol, oz	-	0.75	1.61	0.34	1.10
	Dimethoate 4ec, pt	-	0.05	0.28	0.09	-
	Pyganic, qt	-	-	2.21	1.11	-
Worms	Checkmate CM-F, oz	-	-	9.54	13.63	5.90
	Sprayable Phero, oz	-	-	4.00	14.12	21.30
Worms and Pear Slugs	Imidan 70wp, lb	2.66	-	-	-	-
	Guthion 50wp, lb	20.31	7.64	1.45	0.37	0.58
	Confirm 2F, oz	27.81	54.25	34.66	-	-
	Intrepid 2F, oz	-	-	34.53	55.48	36.47
Worms, Katydid and Pear Slugs	Success, oz	-	-	-	-	14.66
	Assail 70wp, oz	-	-	-	0.13	3.89
POSTHARVEST-Eriophyid Mites	415 Oil	3.10	0.23	-	3.89	0.17
	Diazinon 50wp, lb	-	-	-	3.67	0.17
	Liq Lime Sulfur, gal	2.61	-	-	-	15.46
	Micronized Sulfur, lb	7.27	6.32	15.64	6.55	15.17
<b>TOTAL COSTS</b>	$Y = 202.4 + 9.40x; R = 0.94; P = 0.02$	\$215.54	213.82	\$235.78	\$236.48	\$251.22

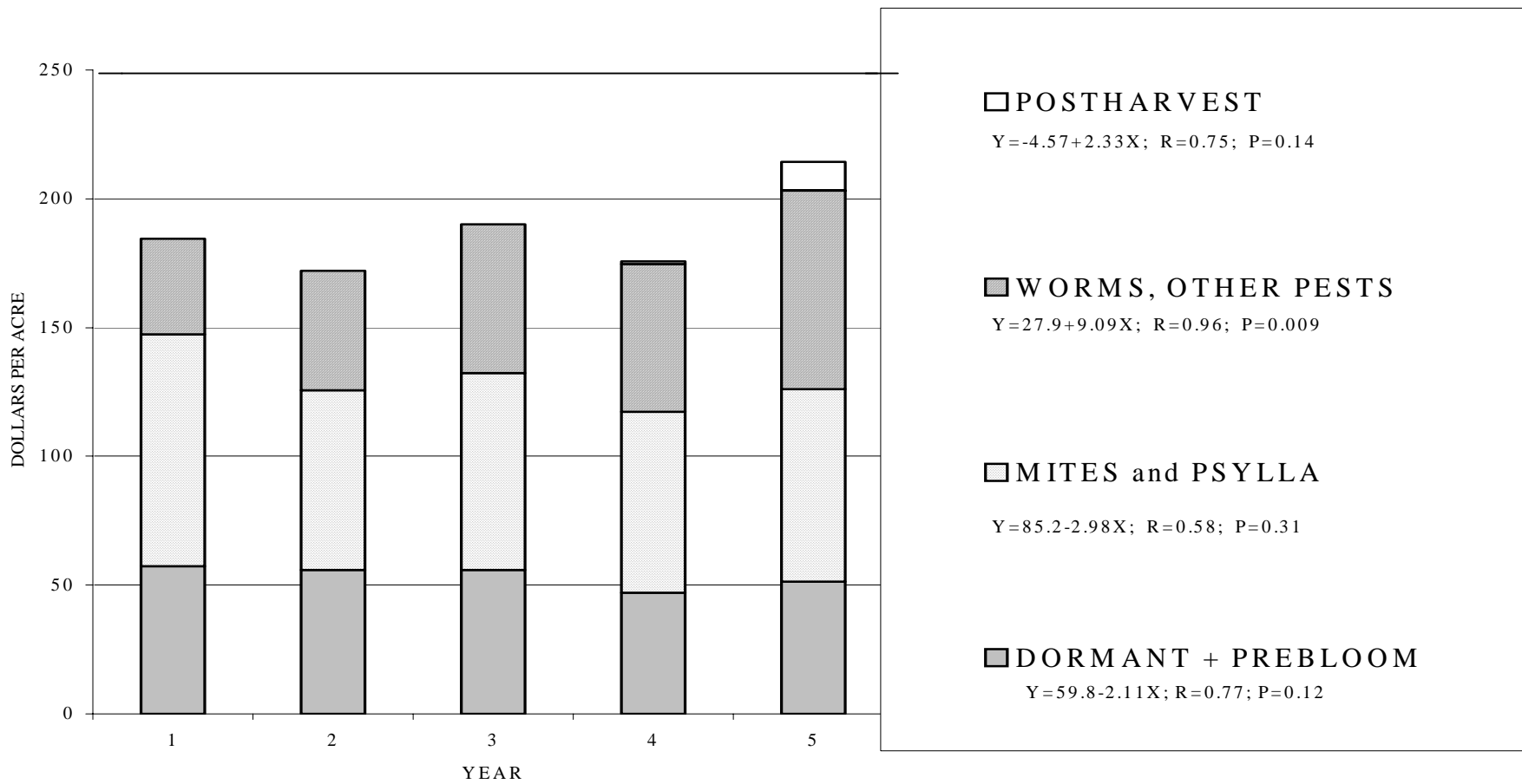
**Table 5.** Pesticide costs in ating disrupted orchards, Mendocino County

Mendocino County	Year	2001	2002	2003	2004	2005
	Mating Disruption acres	756	751.5	725.5	700.5	845.5
	Material	Dollars Per Acre at 2005 Prices				
DORMANT-Scale, Psylla,Oblr and Mites	Dorm Emulsive Oil, gal	\$ 32.76	\$ 32.76	\$ 32.76	\$ 31.45	\$ 31.78
	Lorsban 4e, pt	9.09	7.58	7.58	-	4.00
	415 Oil, gal	11.28	11.28	11.28	11.28	11.28
PREBLOOM-Thrips, Worms and Eriophyids	Asana XL, oz	4.28	4.28	4.28	4.25	4.28
	Liq Lime Sulfur, gal	-	-	-	-	-
	Micronized Sulfur, lb	-	-	-	-	-
FOLIAR-Psylla and Mites	Agrimek 0.15ec, oz	76.26	54.14	43.18	54.87	53.42
	Apollo/Savey, oz	0.41	-	-	2.46	-
	Acramite WS, lb	-	-	18.73	-	8.03
	415 Oil, gal	13.23	15.59	14.55	13.03	13.25
True Bugs, Worms and Cucumber Beetles	Danitol, oz	-	-	1.06	-	0.92
	Dimethoate 4ec, pt	-	-	-	-	-
	Pyganic,qt	-	-	-	-	-
Worms	Checkmate CM-F, oz	-	-	5.15	6.36	10.22
	Sprayable Phero, oz	-	0.24	9.89	9.18	14.12
Worms and Pear Slugs	Imidan 70wp, lb	-	-	-	-	-
	Guthion 50wp, lb	6.29	-	-	-	-
	Confirm 2F, oz	30.85	46.26	22.25	-	-
	Intrepid 2F, oz	-	-	19.46	41.83	36.67
Worms, Katydid and Pear Slugs	Success, oz	-	-	-	-	13.76
	Assail 70wp, oz	-	-	-	-	1.47
POSTHARVEST-Eriophyid Mites	415 Oil	-	-	-	0.93	2.54
	Diazinon 50wp, lb	-	-	-	-	2.54
	Liq Lime Sulfur, gal	-	-	-	-	2.75
	Micronized Sulfur, lb	-	-	-	-	3.36
<b>TOTAL COSTS</b>	Y= 168.3 + 6.34x; R= 0.60; P= 0.28	\$184.45	\$172.13	\$190.17	\$175.64	\$214.39

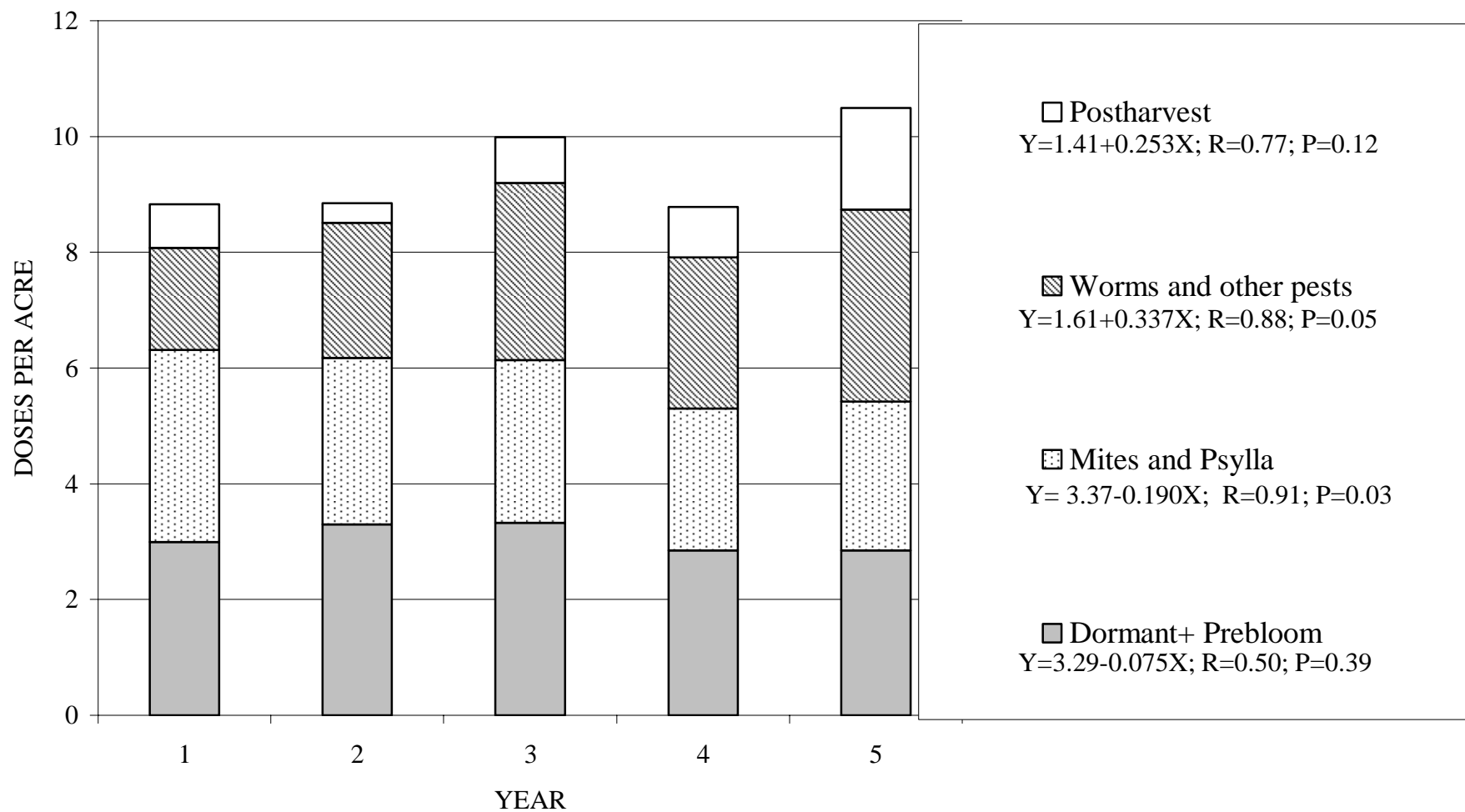


**Figure 1.** Insecticide and miticide costs in mating disrupted orchards; average, Lake County

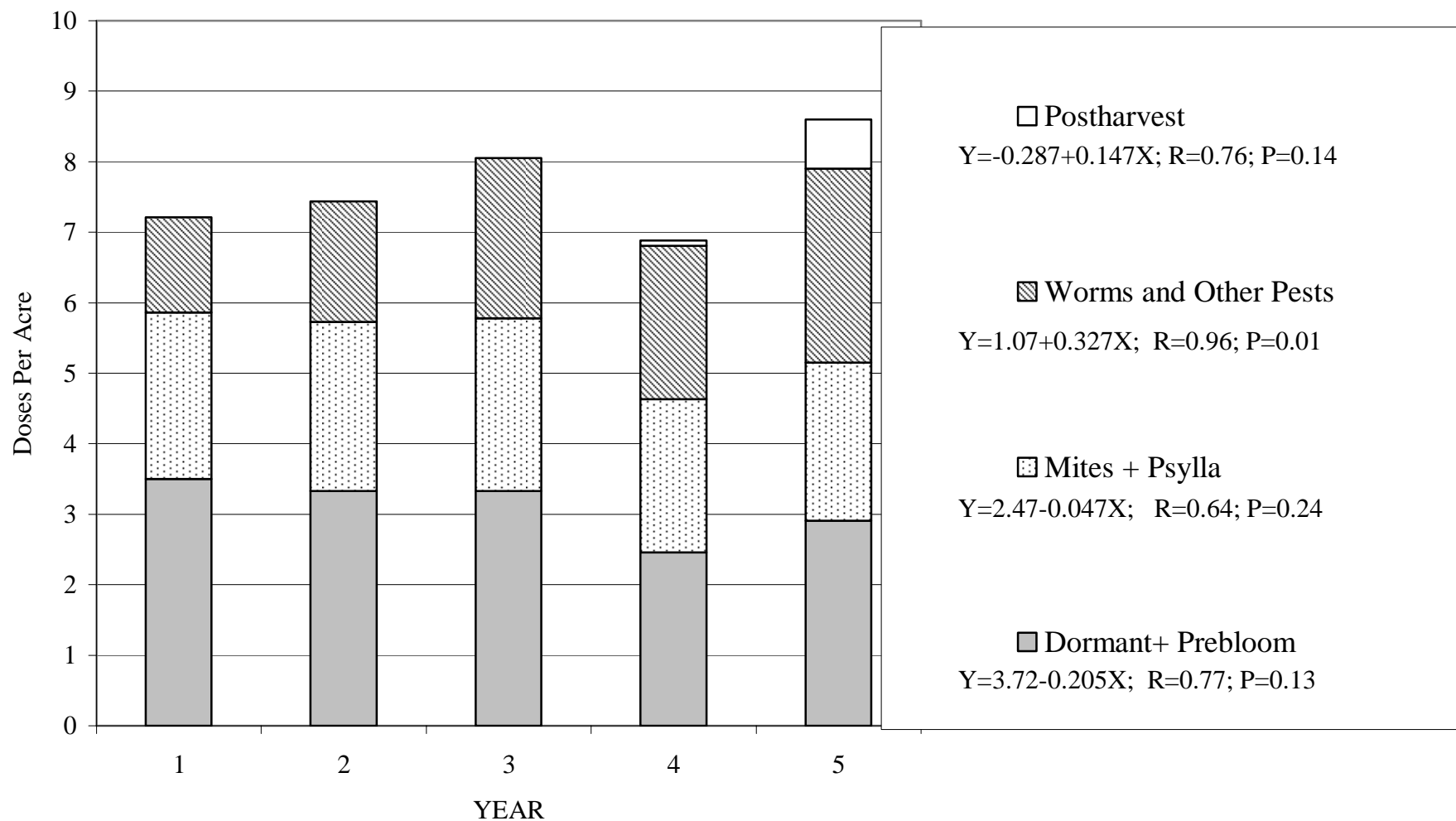




**Figure 2.** Insecticide and miticide costs in mating disrupted orchards; average, Mendocino County



**Figure 3.** Insecticide and miticide doses used in mating disrupted orchards; average, Lake County



**Figure 4.** Insecticide and miticide doses used in mating disrupted orchards; average, Mendocino County