Western IPM Center

Western Integrated Pest Management Center

U.C. ANR Building • 2801 Second Street • Davis, CA 95618 • Tel: (530) 750-1271 • www.westernipm.org

5 July 2017

Office of Pesticide Programs
Environmental Protection Agency
1200 Pennsylvania Ave NW.
Washington, DC 20460-0001

Re: EPA-HQ-OPP-2015-0393, Draft Human Health and Ecological Risk Assessments for pyrethroids and certain other pesticides.
(Bifenthrin - EPA-HQ-OPP-2010-0384, Cyfluthrins (& beta) - EPA-HQ-OPP-2010-0684, Cypermethrin (alpha & zeta) - EPA-HQ-OPP-2012-0167, Cyphenothrin - EPA-HQ-OPP-2009-0842, D-phenothrin - EPA-HQ-OPP-2011-0539, Deltamethrin - EPA-HQ-OPP-2009-0637, Esfenvalerate - EPA-HQ-OPP-2009-0301, Etofenprox - EPA-HQ-OPP-2007-0804, Fenpropathrin - EPA-HQ-OPP-2010-0422, Flumethrin - EPA-HQ-OPP-2016-0031, Gamma-cyhalothrin - EPA-HQ-OPP-2010-0479, Lambda-cyhalothrin - EPA-HQ-OPP-2010-0480, Momfluorothrin - EPA-HQ-OPP-2015-0752, Permethrin - EPA-HQ-OPP-2011-0039, Prallethrin - EPA-HQ-OPP-2011-1009, Pyrethrins - EPA-HQ-OPP-2011-0885, Tau-fluvalinate - EPA-HQ-OPP-2010-0915, Tefluthrin - EPA-HQ-OPP-2012-0501, Tetramethrin - EPA-HQ-OPP-2011-0907)

This comment is being provided by the Western Integrated Pest Management Center in response to the docket on draft assessments for pyrethroids and certain other pesticides – EPA-HQ-OPP-2015-0393.

About us

The Western Integrated Pest Management Center works alongside researchers and extension educators in the Western United States to promote the development, adoption, and evaluation of integrated pest management to solve pest problems. We gather comments from a network of sources throughout the West to provide federal agencies with expert-written reports that assist the agencies in decision-making. Our comment coordinators are associated with the University of California Statewide Integrated Pest Management Program, the Oregon State University Integrated Plant Protection Center, the University of Arizona Pest Management Center and the University of Hawaii Plant and Environmental Protection Sciences Department. The comments in this memo are primarily for California and draw on California's pesticide use reporting database. Comments reflect the principles of integrated pest management.

This comment from California should be considered alongside the comments provided by the rest of the Western IPM Center comment coordinators. The pesticides being considered in this docket are used in several crops in California where they are part of integrated pest management programs and target pests that are resistant to other pesticides or have few alternatives. In this comment, I provide use patterns for agricultural and non-agricultural uses in California. Part of this comment is focused on mushrooms because mushrooms are produced differently than other crops and have unique uses for pyrethroids that are not captured in the risk assessments. Finally, I provide an overview of anticipated uses.

California uses

In California, these pesticides were applied to 206 different agricultural and non-agricultural sites in 2015 (table 1 – as an appendix). The biggest uses of each pesticide are described in table 2.

Table 2. Major agricultural uses of pyrethroids and certain other pesticides in 2015. Please note that these have been sorted by acres treated. Please note that this table only includes major uses of the pesticides used primarily or exclusively in public health (etofenprox, phenothrin, prallethrin, pyrethrins) or structural pest control (beta-cyfluthrin, bifenthrin, cyfluthrin, cypermethrin, deltamethrin, esfenvalerate, gamma-cyhalothrin, lamba-cyhalothrin, permethrin, phenothrin, prallethrin, pyrethrins). This table also includes uses under special registration exemptions such as Section 18 uses. Blank cells indicate a lack of information (i.e. no pest management guidelines or insufficient data). (Source: Pesticide Use Reporting database via the PURwebGIS portal (http://purwebgis.ucdavis.edu/PURwebGIS.html))

Chemical	Crop/Use	Pest(s) targeted	Total Number of Acres Treated	Total Pounds Active Ingredient
(S)-Cypermethrin	Safflower	Armyworm, beet leafhopper, cabbage looper, cutworm, stinkbug, lygus, thrips	110,101.90	5,488.98
	Alfalfa	Blue alfalfa aphid, cowpea aphid, leafhoppers	104,123.45	4,730.79
	Corn (human consumption)		32,987.22	1,576.18
	Sugarbeet		32,423.05	1,315.41
	Leaf Lettuce	Beet armyworm, corn earworm, tobacco budworm, cutworms, darkling beetles, field cricket, garden symphylans, loopers, western flower thrips, lygus	27,145.72	1,263.11
	Cotton	False chinch bug, lygus, stink bugs	26,603.62	1,216.66
	Orange	Asian citrus psyllid, diaprepes root weevil, katydids	23,694.03	1,173.21
	Dry Onion	leafminers	20,799.06	997.51
	Pistachio		20,191.56	924.17
	Processing Tomato	False chinch bug	19,103.29	654.06
Beta-Cyfluthrin	Alfalfa	Cowpea aphid, leafhoppers, pale-striped flea beetle, threecornered alfalfa hopper, weevils	73,050.10	1515.97
	Orange	Asian citrus psyllid, California red scale, citrus peelminer, citrus thrips, diaprepes root weevil, European earwig, glassy-winged sharpshooter, katydids, leaffooted bug	52,283.17	1970.90
	Pistachio	Leaffooted plant bugs, small plant bugs, stink bugs	38,756.11	733.87
	Processing Tomato	False chinch bug, garden symphylans, stink bugs	33,752.84	170.97
	Cotton	False chinch bug, lygus	33,316.99	368.4
	Grape		24,317.49	610.74
	Walnut	Codling moth	18,829.16	62.69
	Tangerine	See orange	14,736.97	506.83
	Leaf Lettuce	Garden symphylans	11,291.26	95.78
	Potato		10,679.41	103.88
	Structural pest control		---	44,421.98
	Landscape maintenance		---	455.04
Bifenthrin	Almond	Leaffooted bug, navel orangeworm, peach twig borer, stink bugs, tree borers	568,311.08	93,622.13
	Pistachio	False chinch bug, leaffooted plant bugs, navel orangeworm, obliquebanded leafroller, small plant bugs, stink bugs	223,945.66	42,276.38
	Processing Tomato	whiteflies	119,901.36	9949.47
	Walnut	Codling moth, navel orangeworm, walnut husk fly	99,392.22	14,046.83
	Cotton	Stink bugs, sweetpotato whitefly	93,622.28	9232.87
	Strawberry	Lygus	66,468.41	6979.88
	Cantaloupe	Crickets, melon aphid	25,882.86	2321.31
	Broccoli	Silverleaf whitefly	22,851.67	2156.11

Chemical	Crop/Use	Pest(s) targeted	Total Number of Acres Treated	Total Pounds Active Ingredient
	Corn (human consumption)		22,195.34	1857.68
	Melon	See cantaloupe	18,475.79	1596.51
	Structural pest control		---	163,373.32
	Landscape maintenance		---	4521.71
Cyfluthrin	Tangerine	See orange	17,303.09	900.29
	Alfalfa	Cowpea aphid, leafhoppers, pale-striped flea beetle, threecornered alfalfa hopper, weevils	16,608.57	660.12
	Corn (human consumption)		16,453.01	738.13
	Orange	Asian citrus psyllid, citrus red mite, fuller rose beetle	13,708.38	767.57
	Processing Tomato		8,800.48	396.43
	Pistachio	Leaffooted plant bugs, small plant bugs, stink bugs	7,270.63	302.76
	Container plants		6,559.34	178.17
	Cotton	Lygus, beet armyworm, looper	5,969.25	256.41
	Wine grape		5,554.85	271.47
	Cantaloupe		4,995.37	220.68
	Structural pest control		---	11,927.36
Cypermethrin	Dry Onion	Leafminers	4,977.10	391.01
	Alfalfa	Blue alfalfa aphid, cowpea aphid, leafhoppers	4,882.60	233.90
	Sugarbeet		1,942.60	87.29
	Animal Premises		1,916.00	232.44
	Celery	lygus	1,016.71	49.27
	Broccoli		960.2	68.07
	Cherry		906.95	23.13
	Cabbage		611.36	29.66
	Kale		568.06	33.97
	Leaf Lettuce	Beet armyworm, corn earworm, tobacco budworm, cutworms, darkling beetles, field cricket, garden symphylans, loopers, western flower thrips, lygus	518.61	24.11
	Structural pest control		---	52,059.18
	Landscape maintenance		---	3341.40
	Dairy equipment		---	
Deltamethrin	Leek		147.13	3.92
	Beet		34.9	0.92
	Turnip		27.2	0.72
	Pumpkin		23.2	0.62
	Structural pest control		---	26,285.15
	Regulatory pest control		---	503.57
	Landscape maintenance		---	47.28
	Buildings		---	41.83
Esfenvalerate	Almond	Tree borers, leaffooted bug, navel orangeworm, peach twig borer, peachtree borer (only registered pesticide), tree borers	264,395.45	16,174.37

Chemical	Crop/Use	Pest(s) targeted	Total Number of Acres Treated	Total Pounds Active Ingredient
	Corn (human consumption)	Aphids, armyworms, corn earworm	66,388.39	3087.71
	Peach		39,617.94	2261.04
	Processing tomato	Beet armyworm, false chinch bug, flea beetles, hornworms, loopers, stink bugs, tomato fruitworm, tomato pinworm, western yellowstriped armyworm	39,604.34	1760.87
	Sugarbeet	Empoasca leafhoppers	35,430.83	1501.59
	Prune	Codling moth, leaf curl plum aphid, mealy plum aphid, peachtree borer, peach twig borer	33,395.46	1862.91
	Broccoli	Cutworms, flea beetles	20,467.12	916.98
	Nectarine	Oriental fruit moth, peach twig borer, peachtree borer (only other registered pesticide is chlorpyrifos), plant bugs, stink bugs	13,705.29	802.22
	Walnut	Codling moth, navel orangeworm, walnut husk fly	12,015.07	783.45
	Head lettuce	cutworms	11,498.82	519.89
	Structural pest control		---	3324.41
Etofenprox	Mushroom	Phorid fly	70.88	21.01
	Public health		---	1586.18
	Structural pest control		---	227.05
Fenpropathrin	Grape	Thrips, black widow spider (only registered pesticide), false chinch bug, sharpshooters	35,662.19	9475.47
	Orange	Asian citrus psyllid, citrus peelminer, citrus thrips, diaprepes root weevil, glassy-winged sharpshooter, katydids, leaffooted bug	33,907.28	12534.56
	Strawberry	Cyclamen mite, lygus, whiteflies	29,493.49	8300.36
	Cherry		12,331.66	3900.56
	Pistachio	False chinch bug, navel orangeworm, obliquebanded leafroller, small plant bugs	11,552.60	4682.14
	Lemon	See orange	10,449.88	3473.18
	Cotton	Sweetpotato whitefly	7,063.21	1951.19
	Tangerine	See orange	6,644.38	2394.62
	Tomato	Beet armyworm, false chinch bug, hornworms, loopers, lygus, stink bugs, tomato fruitworm, whiteflies	5,278.62	1013.74
	Grapefruit	See orange	4,884.96	1420.48
Gamma-Cyhalothrin	Alfalfa	Blue alfalfa aphid, cowpea aphid, leafhoppers, pale-striped flea beetle, threecornered alfalfa hopper, weevils	2,390.00	23.53
	Landscape maintenance		---	503.2
	Structural pest control		---	130.9
Lambda-Cyhalothrin	Alfalfa	Blue alfalfa aphid, cowpea aphid, leafhoppers, pale-striped flea beetle, threecornered alfalfa hopper, weevils	412,770.99	11,821.64
	Pistachio	False chinch bug, leaffooted plant bugs, navel orangeworm, obliquebanded leafroller, small plant bugs, stink bugs	293,655.28	12,783.42
	Almond	Leaffooted bug, navel orangeworm,	248,873.70	8590.83

Chemical	Crop/Use	Pest(s) targeted	Total Number of Acres Treated	Total Pounds Active Ingredient
		peach twig borer, stink bugs, tree borers		
	Rice	Armyworms, rice water weevil, tadpole shrimp	203,769.46	6613.04
	Leaf lettuce	Garden symphylans, western flower thrips	137,065.67	4028.71
	Head lettuce	Garden symphylans, western flower thrips	134,085.44	3808.10
	Processing tomato	Flea beetles, garden symphylans, stink bugs	106,548.52	3134.19
	Corn (human consumption)		66,740.76	2016.29
	Walnut	Codling moth	62,593.69	2255.77
	Cotton	Lygus	48,217.20	1793.59
	Structural pest control		---	13,432.26
Permethrin	Leaf lettuce	Beet armyworm, corn earworm, tobacco budworm, cutworms, darkling beetles, field cricket, loopers, lygus	112,099.94	18,239.96
	Head lettuce	Beet armyworm, corn earworm, tobacco budworm, cutworms, darkling beetles, field cricket, loopers, lygus	77,569.12	13,117.48
	Pistachio	False chinch bug, leaffooted plant bugs, navel orangeworm, small plant bugs, stink bugs	69,955.12	19,305.04
	Alfalfa	Leafhoppers, threecornered alfalfa hopper	64,706.08	11,571.63
	Spinach	caterpillars	57,351.24	8608.69
	Celery	lygus	30,412.98	5148.04
	Almond		28,334.66	6565.11
	Walnut	Codling moth	24,932.26	5963.41
	Processing tomato	False chinch bug	12,830.45	1579.64
	Corn (forage)	Armyworms, corn earworm, cutworms,	11,924.55	1683.74
	Structural pest control		---	157,816.06
	Landscape maintenance		---	24,118.35
Phenothrin	Public health		---	1798.41
	Structural pest control		---	213.24
Prallethrin	Structural pest control		---	413.49
Pyrethrins	Strawberry	Aphids, vinegar fly, western flower thrips	34,027.01	1577.90
	Leaf lettuce	springtails	13,884.16	596.59
	Spinach		9,456.15	412.47
	Orange	Asian citrus psyllid, bean thrips, glassy-winged sharpshooter, greenhouse thrips	9,382.20	511.56
	Grape	Drosophila flies, leafhoppers, sharpshooters	8,662.33	415.47
	Safflower	Beet leafhopper, stinkbug, lygus	8,507.00	191.19
	Celery	Leafminers, lygus	7,118.01	300.99
	Broccoli		6,162.75	264.16
	Wine grape	See grape	6,106.85	217.81
	Almond		5,850.57	219.7
	Public health		---	4995.41
	Structural pest control		---	4558.26
	Landscape maintenance			641.49

Chemical	Crop/Use	Pest(s) targeted	Total Number of Acres Treated	Total Pounds Active Ingredient
Tau-Fluvalinate	Flowers	Aphids, armored scales, armyworms, cutworms, cabbage looper, diamondback moth, mealybugs, fungus gnats, leafhoppers, sharpshooters, shore fly, twospotted spider mites, whiteflies	1,464.98	340.42
	Container nurseries		1,445.87	374.63
	Container nurseries (greenhouse)		760.12	343.05
	Flowers (greenhouse)		303.64	50.08
	Carrot		150	21.12
	Transplants	Aphids, armored scales, armyworms, cutworms, cabbage looper, diamondback moth, mealybugs, fungus gnats, leafhoppers, sharpshooters, shore fly, twospotted spider mites, whiteflies	43.56	9.3
	Christmas trees		39	2.82
	Transplants (greenhouse)	Aphids, armored scales, armyworms, cutworms, cabbage looper, diamondback moth, mealybugs, fungus gnats, leafhoppers, sharpshooters, shore fly, twospotted spider mites, whiteflies	35.14	9.3
Tetramethrin	Structural pest control		---	1.95

In addition to the major uses outlined in table 2, there are some California commodities that use these pesticides. These commodities represent minor acreage but often do not have as many registered pesticides as larger commodities do.

Mushrooms

Mushroom production is unique and considerably different from other commodities. This portion of this comment includes national mushroom production information and is informed by the American Mushroom Institute, California mushroom growers and the Western Region IR-4 Program.

Mushrooms represent a $1 billion industry. In 2016, there were more than 946 million pounds produced in the United States. The majority of production takes place in Pennsylvania (64%) and California (12%). Ninety percent of mushrooms are consumed fresh.

There are two crop profiles published on mushroom. These crop profiles are old so the chemistries and pests represented in the crop profiles are not accurate but the production descriptions are accurate. The Pennsylvania mushroom crop profile is available at https://ipmdata.ipmcenters.org/documents/cropprofiles/PAmushrooms.pdf and the California mushroom crop profile is available at https://ipmdata.ipmcenters.org/documents/cropprofiles/CAmushrooms.pdf.

As is indicated in the profiles, mushroom production occurs indoors. Production starts with substrate preparation – a process of recycling organic matter to create a physical and biological substrate optimized for mushroom production that requires about three weeks. The second phase is a closely managed process which includes steam pasteurization at 140°F for 2 to 3 hours. The substrate is spawned (seeded) and the spawn is allowed to grow through the compost for 2 weeks. When the substrate is fully colonized by the spawn, a casing layer made from sphagnum peat moss (or similar material) and lime is applied to the surface of the substrate. The casing is irrigated periodically and both temperature and carbon dioxide levels are managed during the 16-day period required for the spawn to form into mushrooms. Mushrooms grow rhythmically, being ready for harvest every five to seven days. Each wave of mushrooms is called a break or flush with farms keeping the crop for three breaks. Harvesting is done by hand. After three breaks have been harvested, the production room is steam pasteurized, cleaned out and prepared for another filling. Each production room is occupied by a crop for nine to 12 weeks which means 4 to 6 crops can be grown in a room each year. The standard production room contains 8,000 square feet of

production surface and it is called a 'double'; average production is 6.5 pounds per square feet (fresh weight) per crop cycle.

The major insect pests of mushrooms are sciarid and phorid flies. These flies vector fungal and bacterial diseases and control of adult flies drives most pesticide applications. Flies are capable of finding cracks in walls to find entry into rooms during the second phase and after spawning. The greatest threat of infestation is greatest from March to July and September through late November. Flies will land and lay their eggs on compost that is closest to the point of entry. The flies detect the presence of Trichoderma – a major pest of mushrooms – and lay eggs near where this fungus grows, further spreading the disease. Eggs hatch in a few days quickly become adults. Larvae feed on developing mycelium and compost.

There are three major integrated pest management tools to control these flies: monitoring, exclusion and chemical controls. To exclude the flies, growers place plastic on bed surfaces, keep doors and other entry points closed, and use black light monitors to observe pest populations. There are two main types of insecticides are used to control the flies – insect growth regulators and adulticides. The use of insect growth regulators is dependent on timing of the application. The growth regulators' specific mode of action is tied to particular stages of larval development and those things dictate application timing. Monitoring also determines pesticide applications. Adulticides are used preventatively and target the adult stage of the fly. They have **a strong fit in an integrated pest management program** because they are used when exclusion fails and when there are high population levels. Preventative applications are used as chemical barriers and while not as effective as physical barriers serve an important role in controlling entry points that are been overlooked. Pyrethroids are also used as a space spray for control of mushroom flies or fungus gnats. They are often applied to growing surfaces using a spray or fogged into the air in growing rooms using atomisters or ULV sprayers.

Phorid flies are a new pest for the industry. There are options available to control sciarid flies such as insect growth regulators and biocontrols. But none of these options control phorid flies. To control phorid flies, growers use permethrin but are working with the IR-4 program to identify other options so that they can practice good resistance management.

As the chemistries in this docket are at the risk assessment stage, I would like to comment on the unique growing conditions that reduce risk. Insecticide applications in mushrooms are made in places where bees are not active. Many applications are made inside growing rooms where bees and other large insects are excluded. Applications to building exteriors such as exhaust and intake vents also pose little risk to bees as those areas are kept weed free. Most mushroom farms are required to keep runoff water on site. When water is used in outdoor composting, that water is discharged under the required Regional Water Quality Board discharge permit, limiting residual contaminants including pesticide residues.

As described above, these chemistries are important to this industry because of the new phorid fly pest and because their registered options are limited. The pesticides used by the mushroom industry in California in 2015 are outlined in table 3. A list of approved insecticides is available at http://americanmushroom.org/insecticides/. In addition to these pesticides, etofenprox, spinosad, and stylet oil are going through the IR-4 process.

Table 3. Pounds of active ingredient used in California mushroom production in 2015. Some pesticides were used under Section 18 permissions. (Source: Pesticide Use Reporting database via the PURwebGIS portal (http://purwebgis.ucdavis.edu/PURwebGIS.html)).

ai_type	chemical	Mushroom	Mushroom House	Mushroom Soil	Totals
Fumigant	Dazomet	15.41			15.41
Fungicide	Hydrogen Peroxide	50.61			50.61
	Thiabendazole	3,591.93			3,591.93
Fungicide/ Insecticide	Clarified Hydrophobic Extract Of Neem Oil	1,682.68			1,682.68
Insecticide	Azadirachtin	5.84	0.03		5.87
	Cyromazine	166.48		15.88	182.36
	Etofenprox	21.01	0.7		21.71

ai_type	chemical	Mushroom	Mushroom House	Mushroom Soil	Totals
	Malathion	0.32			0.32
	Permethrin	199.52	23.03		222.55
	Petroleum Distillates, Aromatic	0.2			0.2
	Piperonyl Butoxide	229.37	57.14		286.51
	Piperonyl Butoxide, Other Related	36.33	13.59		49.92
	Pyrethrins	2.68	1.04		3.72
	S-Methoprene		5.37	135.42	140.78
null	Natamycin	0.97			0.97
Other	Alkyl (60%C14, 30%C16, 5%C12, 5%C18) Dimethylbenzyl Ammonium Chloride		8.14		8.14
	Alkyl (68%C12, 32%C14) Dimethylethylbenzyl Ammonium Chloride		8.14		8.14
	Peroxyacetic Acid	2.09			2.09

Other crops and anticipated registrations.
The appendix (table 1) outlines uses of these pesticides in other crops. Many of the smallest crops have very limited chemical options for insect control.

The following Western needs are going through the IR-4 process.

- Bifenthrin on mustard greens for aphids, grasshoppers, and flying insects; on orange, lemon, and grapefruit for fuller rose beetle; on grape for grape root borer; on cranberry for fruitwoms, flea beetle, fireworm, tipworm, spanworm, and white grup; on clover seed for mites, aphids, lygus, and weevils; on safflower for lygus, beet leafhopper, stink bug; on avocado for ambrosia beetle; and on pomegranate for katydid, navel orangeworm, leafrollers, plant bugs, stink bugs, fuller rose beetle, aphids, whitelies, and scale
- Etofenprox on grasses, leaf lettuce and oranges for residue from mosquito control
- Etofenprox on mushroom
- Gamma-cyhalothrin on okra and pistachio
- Lambda cyhalothrin on asparagus, carrot, cherry, mustard greens, okra, radish, and wild rice
- Cyfluthrin on safflower
- Beta-cyfluthrin on flax
- Fenpropathrin on avocado, barley, mustard greens, turnip, sweet potato and olive

Please contact me if further information is needed. The requests submitted by the Western IPM Center are archived at http://westernipm.org/index.cfm/searchable-data-sources/information-request-replies/.

Sincerely,

Digitally signed by Amanda Crump
Date: 2017.07.07 16:39:22 -07'00'

Amanda Crump, Director of the Western IPM Center
530-750-1271; acrump@ucanr.edu

References:

- California Pesticide Use Reporting database - http://www.cdpr.ca.gov/docs/pur/purmain.htm
- PURwebGIS portal - http://purwebgis.ucdavis.edu/PURwebGIS.html
- Safflower Pest Management Strategic Plan - https://ipmdata.ipmcenters.org/documents/pmsps/CASafflowerPMSP2016.pdf
- University of California Pest Management Guidelines:
    - Alfalfa - http://ipm.ucanr.edu/PDF/PMG/pmgalfalfa.pdf
    - Corn - http://ipm.ucanr.edu/PDF/PMG/pmgcorn.pdf
    - Sugarbeet - http://ipm.ucanr.edu/PDF/PMG/pmgsugarbeet.pdf

- Lettuce - http://ipm.ucanr.edu/PDF/PMG/pmglettuce.pdf
- Cotton - http://ipm.ucanr.edu/PDF/PMG/pmgcotton.pdf
- Onion - http://ipm.ucanr.edu/PDF/PMG/pmgoniongarlic.pdf
- Citrus - http://ipm.ucanr.edu/PDF/PMG/pmgcitrus.pdf
- Pistachio - http://ipm.ucanr.edu/PDF/PMG/pmgpistachio.pdf
- Tomato - http://ipm.ucanr.edu/PDF/PMG/pmgtomato.pdf
- Grape - http://ipm.ucanr.edu/PDF/PMG/pmggrape.pdf
- Walnut - http://ipm.ucanr.edu/PDF/PMG/pmgwalnut.pdf
- Potato - http://ipm.ucanr.edu/PDF/PMG/pmgpotato.pdf
- Almond - http://ipm.ucanr.edu/PDF/PMG/pmgalmond.pdf
- Strawberry - http://ipm.ucanr.edu/PDF/PMG/pmgstrawberry.pdf
- Cucurbits - http://ipm.ucanr.edu/PDF/PMG/pmgcucurbits.pdf
- Cole crops - http://ipm.ucanr.edu/PDF/PMG/pmgcolecrops.pdf
- Celery - http://ipm.ucanr.edu/PDF/PMG/pmgcelery.pdf
- Cherry - http://ipm.ucanr.edu/PDF/PMG/pmgcherry.pdf
- Prune - http://ipm.ucanr.edu/PDF/PMG/pmgprune.pdf
- Nectarine - http://ipm.ucanr.edu/PDF/PMG/pmgnectarine.pdf
- Rice - http://ipm.ucanr.edu/PDF/PMG/pmgrice.pdf
- Spinach - http://ipm.ucanr.edu/PDF/PMG/pmgspinach.pdf
- Floriculture and ornamental nurseries - http://ipm.ucanr.edu/PDF/PMG/pmgfloriculture.pdf
- Carrot - http://ipm.ucanr.edu/PDF/PMG/pmgcarrot.pdf

2015 Pesticide Use Report (pounds active ingredient																		
chemical	(S)-Cypermethrin	Beta-Cyfluthrin	Bifenthrin	Cyfluthrin	Cypermethrin	Deltamethrin	Esfenvalerate	Etofenprox	Fenpropathrin	Gamma-Cyhalothrin	Lambda-Cyhalothrin	Permethrin	Phenothrin	Prallethrin	Pyrethrins	Tau-Fluvalinate	Tetramethrin	Totals
Alfalfa (23001)	4,730.79	1,515.97	324.29	660.12	233.9					23.53	11,821.64	11,571.63			19.38	0.05		30,901.31
Almond (3001)	444.27	122.56	93,622.13	46.09		0.13	16,174.37		453.86		8,590.83	6,565.11			219.7			126,239.04
Amaranth, Edible (Chinese Spinach) (13033)				6.15								0.1						6.25
Animal Premise (61001)		286.16		0.8	232.44						2.13	173.71	0.01		0.13			695.38
Anise (8004)												1.38						1.38
Apple (4001)		13.43		1.56			24.61		877.45	0.03	101.51				34.23			1,052.82
Apricot (5001)		4.99		3.41			157.59		42.24		88.96				0.57			297.75
Arrugula (13056)	64.82	8.91		0.37	1.91							231.49			63.86			371.36
Artichoke, Globe (13018)	370.92		1,064.42		2.84		537.56					2,441.76			37.57			4,455.07
Asparagus (16002)												249.81			28.14			277.95
Avocado (28000)									273.2						2.02			275.22
Barley (29103)		1.79									16.97				9.37			28.13
Barley (Forage - Fodder) (22008)											66.79							66.79
Basil, Sweet (8006)			0.09												51.64			51.73
Bean, Dried (15001)	97.02	12.06	1,521.69	1.31			23.71				503.7				1.04			2,160.52
Bean, Succulent (15003)	7.85	0.6	119.92				5.86				12.3				3.25			149.77
Bean, Unspecified (28001)	18.83	0.52	17.91				14.78				19.59				1.46			73.09
Beet (29109)	52.46	0.02	36.15		2.52	0.92									10.87			102.94
Bermudagrass (22017)	23.56			33.43							117.72							174.71
Bitter Melon (10017)											0.06							0.06
Blackberry (1002)	130.37		45.34		1.45				4.01						77.54			258.71
Blueberry (1009)	69.6		20.5						117.69						138.18			345.97
Bok Choy (13502)	122.05	24.66	86.42		5.17		0.04				13.27	4.81			7.39			263.81
Broccoli (13005)	846.92	37.1	2,156.11	75.33	68.07		916.98		5.96	0.17	1,219.62	1,077.09			264.16			6,667.52
Brussels Sprout (13006)	99.53	1.71	60.01	8.71	0.75				1.88		300.04	23.3			16.23			512.16
Buildings/Non-Ag Outdroor (67003)		0.17	0.37	4.16	39.48	41.83	0.3				12.07	31.83		0.08	5.42			135.71
Cabbage (13007)	358.02	18.89	472.75	19.44	29.66		119.62				355.1	661.24			12.71			2,047.44
Cabbage, Savoy (13505)	0.93																	0.93
Canola (Rape) (28051)					0.49													0.49
Cantaloupe (10002)	73.1	1.96	2,321.31	220.68			181.68		312.93		103.53	1,085.28			5.37			4,305.85
Cardoon (13032)	2.92											2.94						5.86
Carrot (29111)	120.02	1.4	82.48	2.99	3.73		506.32								10.01	21.12		748.06
Cauliflower (13008)	192.57	7.45	436.44		10.89		225.69				401.42	156.58			102.8			1,533.83
Celery (29113)	682.69	53.06	752.12	55.55	49.27						0.27	5,148.04			300.99			7,041.99
Cherry (5002)	292.15	11.88			22.13		111.21		3,900.56		1,499.33	127.76			6.94			5,971.94
Chervil (13055)															0.91			0.91
Chicory (28034)															0.33			0.33
Chinese Broccoli (White Flowering) (Gai Lon) (13053)							0.09				2.67	0.45						3.21
Chinese Cabbage (Nappa) (13010)	203.99	26.39	49.25	0.09	15.26		21.95				67.3	189.67			30.03			603.94
Chinese Greens (13999)	3.36											0.2			0			3.56
Chive (14005)															24.33			24.33
Christmas Tree (30005)			1.79				0.49					2.56				2.82		7.65
Cilantro (13501)	47.99		8.73		1.25										8.4			66.37
Citrus (2000)	10.48	3.24		1.42					3.8						1.82			20.76
Clover (23003)	27.18																	27.18
Cole Crop (13004)															3.57			3.57
Collard (13009)	10.29	0.9	23.86	0.01	0.1							1.33			4.44			40.94
Commodity Fumigation (90)		0.01	4.16	0.1		21.31	0.18		0.31		0.14			0.01	16.66			42.88
Corn (Forage - Fodder) (22005)	69.26	8.41	1,268.50	25.6			50.06				286.13	1,683.74			1.83			3,393.53
Corn, Human Consumption (29119)	1,576.18	170.69	1,857.68	738.13	22.25		3,087.71				2,016.29	299.67			17.67			9,786.27
Cotton (29121)	1,216.66	368.4	9,232.87	256.41			10.49		1,951.19		1,793.59				111.55			14,941.15
County Ag Comm (60)			1.51			0.09					0.03		0.01		0			1.64
Cucumber (10010)	1.43	0.64	253.13	0.2	0.14		0.61				18.36	0.2			3.62	0.01		278.34
Daikon (14023)			1.59				1.37								2.61			5.57
Dairy Equipment (60000)				0.19	185.99										0.15			186.33

2015 Pesticide Use Report (pounds active ingredient																		
chemical	(S)-Cypermethrin	Beta-Cyfluthrin	Bifenthrin	Cyfluthrin	Cypermethrin	Deltamethrin	Esfenvalerate	Etofenprox	Fenpropathrin	Gamma-Cyhalothrin	Lambda-Cyhalothrin	Permethrin	Phenothrin	Prallethrin	Pyrethrins	Tau-Fluvalinate	Tetramethrin	Totals
Dandelion Green (13014)	0.05											0.2			0.04			0.29
Date (6004)			0.03															0.03
Dill (8015)															1.26			1.26
Dried Fruit (43026)		0.01																0.01
Edible Flowers (29008)															0.56			0.56
Eggplant (11001)	40.21	0.35	26.12	7.47			29.49				5.19	12.12			9.9			130.86
Endive (Escarole) (13015)	16.69	2.82			1.17							199.71			2.48			222.87
Farm/Ag Building (61000)				0			0.14							0.04	0.01			0.19
Fava Bean (28059)	0.9										9.08				0.34			10.33
Fennel (28008)	9.31	0.12	5.59		0.26							60.2			0.26			75.74
Fig (6005)															0			0
Food Procressing Plant (71000)		0.02	1.3			0.12									0.15			1.59
Forage Hay/Silage (22000)		34.37		2.7							78.41							115.48
Forest, Timberland (30000)							5.51				3.46	55.89						64.85
Fumigation, Other (91)		7.28	0.05	7.65		6.61	2.07					0.72	0	0.48	16.72			41.58
Gai Lon (13903)	10.04	1.36			2.51		1.02				18.04	0.53						33.5
Garbanzo Bean (15032)		3.14	0.06								16.65				1.27			21.11
Garlic (14007)	129.27				12.45						112.16	276.52			5.68			536.09
Ginger (8019)											0.75							0.75
Grain (28078)											9.52				38.11			47.63
Grape (29141)	43.11	610.74	234.7	230.35					9,475.47						415.75			11,010.11
Grape, Wine (29143)	3.49	18.28	493.46	271.47					1,254.28			0.26			217.81			2,259.06
Grapefruit (2002)	61.59	29.39		28.83					1,420.48						36.33			1,576.62
Grass, Seed (28066)											0.02							0.02
Herb, Spice (8000)	0.11											41.28			19.34			60.74
Hops (8020)															0.78			0.78
Industrial Site (77000)		0.11	0.09	0.09	0.1		0.46				0	0.1	0	0.03	0.12			1.12
Kale (13011)	220.32	18.33	124.43	1.46	33.97						0.82	0.93			254.99			655.25
Kiwi (6018)							4.43											4.43
Kohlrabi (13012)	0.66	0.28	3.11		0.01		0.04				0.13	0.99			0			5.23
Kumquat (2003)	0.29								7.19						0.16			7.64
Landscape Maintenance (30)	0.39	455.04	4,521.71	7.86	3,341.40	47.28	9.31	0.28	4.95	503.2	82.99	25,118.35	0.61	0.16	641.49	28.41	0.07	34,763.49
Leek (14010)	31.69				4.73	3.92									0.77			41.11
Lemon (2004)	445.69	175.08	20.6	161.98	6.79				3,473.18						189.35			4,472.67
Lettuce, Head (13045)	859.68	55.83	905.35	71.8	37.14		519.89				3,808.10	13,117.48			44.79			19,420.05
Lettuce, Leaf (13031)	1,263.11	95.78		2.18	24.11		0.88				4,028.71	18,239.96	0		596.59		0	24,251.33
Lime (2005)	5.37	0.54							91.42						6.09			103.42
Melon (29122)	48.92		1,596.51	93.16			41.54		269.66		52.89	304.71			7.52	0.01		2,414.93
Mint (28012)															20.66			20.66
Mizuna (13504)	25.24		0.12	0.12	1.42										10.98			37.88
Mushroom (16003)								21.01				199.52			2.68			223.21
Mushroom House (61007)								0.7				23.03			1.04			24.76
Mustard (29123)	20.26	3.46	18.23		0.18										26.47			68.59
Mustard Greens (13021)	74.93	4.01	5.06	0.13	3.52		0.33								37.01			125
N-Grnhs Flower (151)		0.05	26.21	14.74	0.25	0.12	0.23				7.94	346.19			20.93	50.08		466.74
N-Grnhs Plants In Containers (153)	0.5	0.27	189.79	20.04	2		1.03		148.35		6	392.14		0	15.04	343.05		1,118.20
N-Grnhs Transplants (155)	2.23		14.06	1.24			0.91		0.26		0.93	37.56			16	14.29		87.49
N-Outdr Flower (152)		0.23	48.7	20.07			0		4.09		15.96	1,138.28			86.71	340.42		1,654.45
N-Outdr Plants In Containers (154)	2.41	23.07	707.09	178.17	0.3	0.03	25.38		310.26		56.58	1,958.36			22.1	374.63		3,658.37
N-Outdr Transplants (156)	33.6	0.17	81.16	3.95	0.1		106.7		91.94		45.2	126.61			79.97	9.3		578.7
Nectarine (5003)		8.79		17.07			802.22		301.89		277				76.28			1,483.25
null	0.45		261.97	1.82			9.9				6.4	45.57						326.1
Nursery Soil (40501)			46.44															46.44
Oat (29125)											2.13							2.13
Oat (Forage - Fodder) (22006)		0.53									2.67							3.2

2015 Pesticide Use Report (pounds active ingredient																		
chemical	(S)-Cypermethrin	Beta-Cyfluthrin	Bifenthrin	Cyfluthrin	Cypermethrin	Deltamethrin	Esfenvalerate	Etofenprox	Fenpropathrin	Gamma-Cyhalothrin	Lambda-Cyhalothrin	Permethrin	Phenothrin	Prallethrin	Pyrethrins	Tau-Fluvalinate	Tetramethrin	Totals
Olive (28014)									298.25		0				100.2			398.45
Onion, Dry (14011)	997.51				391.01						619.43	2,126.46			15.41			4,149.83
Onion, Green (16004)	20.19				0.27										0.55			21
Orange (2006)	1,173.21	1,970.90	1,538.00	767.57	9.43				12,534.56	0.01					511.56			18,505.24
Orchard Floor (28509)	0.34	0.65										3.24						4.23
Orchardgrass (22028)	2.22	1.64									10.23							14.09
Oregano (8026)															6.18			6.18
Parsley (13022)	63.04	0.08	0.2	0.05	0.93							55.31			4.49			124.11
Pastureland (28035)	215.58	109.32					0.08				20.13				1.86			346.97
Peach (5004)	3.65	106.96		20.26			2,261.04		371.37		880.88	1,081.28	0.9		46.04		1.44	4,773.82
Pear (4003)	0.2	2.38	4.23				229.54		23.14		130.99				5.85			396.32
Peas (29127)	250.42	0.3	267.69		1.33		34.82				204.51				1.53			760.61
Pecan (3008)	3.03	18.65	78.55								36.32							136.55
Pepper, Fruiting (11003)	743.58	45.53	571.3	60.68	4.38		57.18		81.08		229.13	114.43			21.09			1,928.40
Pepper, Spice (8050)			0.66				1.07								0.81			2.53
Persimmon (6012)															0			0
Pimento (11004)	0.5										0.31							0.82
Pistachio (3011)	924.17	733.87	41,276.38	302.76					4,682.14		12,783.42	19,305.04			87.74			80,095.52
Plum (5005)	0.33	4.14		5.13			545.27		82.12		262.42				14.95			914.36
Pluot (5505)							2.75				0.11							2.86
Pome Fruit (4000)	2.32																	2.32
Pomegranate (6015)															20.29			20.29
Pomelo (2012)	3.62	0.59		3.47					2.35						1.13			11.17
Potato (14013)	115.53	103.88	1,204.48	57.88		0.09	314.06				118.85	176.91			11.02			2,102.70
Poultry (55000)												1.99						1.99
Prune (5006)		3.69	5.81				1,862.91				68.22	1.99						1,942.62
Public Health (50)		18.13	1,646.99	14.18	0.68	15.66	0	1,586.18			16.3	2,313.05	1,798.41	105.4	4,995.41	0.12	0.13	12,510.63
Pumpkin (10011)	5.28		324.63	6.08		0.62	0.78				11.9	34.17			1.79			385.25
Quince (4004)	0.44	0.44									3.26							4.15
Radicchio (13524)	5.59	0.32			1.67							694.83			55.41			757.82
Radish (14014)	36.91	16.07	6.03		0.02		21.53								1.31			81.86
Rangeland (28045)	4.08										10.04							14.12
Rappini (13052)	72.79	1.51	463.11		21.57						2.51	2.74			0.84			565.07
Raspberry (1006)	533.44		94.42		0.04				42.79						227.43			898.11
Regulatory Pest Control (100)	0.1	58.09	1,799.97	25.2	1.7	503.57	5.96	0.17			252.44	1,091.75	0.43	0.61	82.35		0.17	3,822.52
Research Commodity (99)	7.91	0.15	25.61	0.08	0.34		2.43		0.2		7.79	1.43			0.45	8.41		54.79
Residential (68002)															0			0
Rice (28072)	585.62					12.76	1.63				6,613.04				0.34			7,213.38
Rice, Wild (24013)	0.23		45.96								70.86							117.05
Rights Of Way (40)	4.53	3.17	10.94		1.9	0.13	12.53		0.78		145.39	128.62	0.17	1.23	49.53		0.01	358.94
Root Vegetable (28061)															1.78			1.78
Rosemary (8032)															9.35			9.35
Rutabaga (14015)															0.06			0.06
Rye (28064)											2.77							2.77
Ryegrass (22035)	7.05																	7.05
Safflower (29129)	5,488.98														191.19			5,680.18
Sage (8035)															6.46			6.46
Shallot (14017)	0.27														2.43			2.7
Small Fruits/Berry (1000)															0.03			0.03
Soil Fumigation/Preplant (40008)	1.05	0.46	366.83				8.64				5.76							382.75
Sorghum (Forage - Fodder) (22004)	63.29										12.94							76.23
Sorghum/Milo (29131)	20.85	4.39									45.1							70.34
Soybean (28023)															0.01			0.01
Spinach (13024)	736.9	7.5	0.06	17.57	17.54						1.01	8,608.69			412.47			9,801.74
Squash (10012)	3.04		199.79		0.43		1.49				8.42	0.69			5.04			218.9

2015 Pesticide Use Report (pounds active ingredient																		
chemical	(S)-Cypermethrin	Beta-Cyfluthrin	Bifenthrin	Cyfluthrin	Cypermethrin	Deltamethrin	Esfenvalerate	Etofenprox	Fenpropathrin	Gamma-Cyhalothrin	Lambda-Cyhalothrin	Permethrin	Phenothrin	Prallethrin	Pyrethrins	Tau-Fluvalinate	Tetramethrin	Totals
Squash, Summer (10013)	7.07		165.75	0.51			0.98				4.37	0.1			0.56			179.33
Squash, Winter (10014)	6.23		27.03								1.85				5.53			40.64
Squash, Zucchini (10015)															3.64			3.64
Stone Fruit (5000)															0.27			0.27
Storage Area/Box (46000)															2.76			2.76
Strawberry (1016)			6,979.88						8,300.36						1,577.90			16,858.14
Structural Pest Control (10)	15.2	44,421.98	163,373.32	11,927.36	52,059.18	26,285.15	3,324.41	227.05		130.9	13,432.26	157,816.06	213.24	413.49	4,558.26	2.3	1.95	478,202.14
Sudangrass (22011)	2.13										85.62							87.75
Sugarbeet (29135)	1,315.41				87.29		1,501.59				4.99							2,909.28
Sugarbeet (Forage - Fodder) (23009)	11.89																	11.89
Sunflower (29133)	0.97		4.09	0.48			300.64				247.2							553.37
Sweet Potato (14018)	9.99		107.39															117.38
Swiss Chard (13025)	65.29	2.24	2.03	0.34	1.61							123.56			64.72			259.78
Tangelo (2007)	42.04	46.4	11.3	37.39	1.24				603						14.2			755.57
Tangerine (2008)	850.64	506.83		900.29	12.58				2,394.62						45.35			4,710.32
Tarragon (8041)															6.26			6.26
Tat Soi (Spinach Mustard) (13515)				0.07											0.17			0.25
Thyme (8042)															4.11			4.11
Timothy (22029)		29.45									0.12							29.57
Tomatillo (11008)		0.11	0.23						0.39			0.45			0.2			1.39
Tomato (11005)	431.76	36.44	1,047.93	96.32	10.19		251.05		1,013.74	0	285.71	260.52			25.83			3,459.49
Tomato, Processing (29136)	654.06	170.97	9,949.47	396.43			1,760.87		318.9		3,134.19	1,579.64			61.07			18,025.59
Triticale (24011)											36.72				1.35			38.07
Tropical/Subtropical Fruit (6000)															0.05			0.05
Turf, Golf Course (Fairways, Greens, Rough) (33007)			0.73								3.19							3.91
Turf/Sod (33008)			9.42								3.35							12.77
Turnip (29137)	10.97	0.98	2.74	0.23		0.72	2.56								2.51			20.71
Turnip (Turnip Greens) (13026)	0.87																	0.87
Uncultivated Ag (66000)	1.25		63.49	0.42	0.02		11.38				5.55	31.71			3.43			117.24
Uncultivated Non-Ag (67000)							0.1				3.02	9.55		0.03				12.7
Unknown (-1)		0.09	17.43	0.25	0.45	0.18	0.07				4.49	0.85	0.01	0.02	0.59			24.43
Vegetable (28024)							0.26				1.44	0.47			0.74			2.92
Vegetables, Fruiting (11000)															2.04			2.04
Vegetables, Leafy (13000)	0.13											0.38			3.07			3.58
Vertebrate Control (80)		1.58	2.64		0.06	1.98	14.19		0.39				0.02	0.18	14.48		0.04	35.56
Walnut (3009)	44.68	62.69	14,046.83	6.54	40		783.45		400.24	0.13	2,255.77	5,963.41			2.08			23,605.82
Watercress (13027)	0.86	0.12													0.84			1.82
Watermelon (10008)	6.93	0.29	705.24				18.05				53.06	33.86			10.67			828.1
Wheat (29139)	65.5	13.71	3.17	14.06							454.77				28.66			579.87
Wheat (Forage - Fodder) (22007)		13.27									213.64							226.91
Yam (14021)				0.81														0.81
Totals	30,960.39	52,773.37	371,627.18	17,969.01	57,067.98	26,943.23	37,068.07	1,835.39	55,948.93	657.96	80,884.93	294,992.01	2,013.82	521.76	17,919.18	1,195.01	3.8	1,050,382.01