

Use Trends of Biopesticides: Pounds Applied

Text files of data are available at <<https://files.cdpr.ca.gov/pub/outgoing/pur/data/>>. The reported pounds of chemicals used that are biopesticides. Biopesticides include microorganisms and naturally occurring compounds, or compounds similar to those found in nature that are not toxic to the target pest (such as pheromones). Use includes both agricultural and reportable nonagricultural applications.

Chemical	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
(3s, 6r)-3-methyl-6-isopropenyl-9-decen-1-yl acetate	None	None	<0.01	None	<0.01	None	<0.01	12	148	65
(3s, 6s)-3-methyl-6-isopropenyl-9-decen-1-yl acetate	None	None	<0.01	None	<0.01	None	<0.01	12	148	65
(e)-4-tridecen-1-yl acetate	96	None	None	None	23	None	None	None	<0.01	<0.01
(e)-5-decen-1-ol	None	None	<0.01	<0.01	<0.01	1	8	2	2	45
(e)-5-decenol	1	<0.01	2	3	1	33	8	95	5	5
(e)-5-decenyl acetate	5	2	10	7	4	25	134	99	63	741
(e,e)-9, 11-tetradecadien-1-yl acetate	2	6	3	4	3	3	1	12	2	<0.01
(e,z)-7,9-dodecadien-1-yl acetate	50	249	270	24	24	None	None	None	None	None
(s)-kinoprene	277	191	300	285	311	429	327	253	378	531
(s)-verbenone	None	None	55	None	None	781	633	28	5	26
(z)-11-hexadecen-1-yl acetate	None	1	None	None	None	None	<0.01	98	34	30
(z)-11-hexadecenal	None	None	None	None	None	1	1	98	33	19
(z)-4-tridecen-1-yl acetate	3	None	None	None	1	None	None	None	<0.01	3
(z)-9-dodecenyl acetate	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	None	None	None	None
(z,e)-7,11-hexadecadien-1-yl acetate	2	None	None	None	None	None	None	None	None	None
(z,z)-11,13-hexadecadienal	<0.01	571	271	321	619	969	1,072	1,086	1,404	1,846

Chemical	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
(z,z)-7,11-hexadecadien-1-yl acetate	3	None	None	None	None	None	None	None	None	None
1,4-dimethylnaphthalene	1,152	544	893	1,163	1,085	891	660	133	836	379
1,7-dioxaspiro-(5,5)-undecane	<0.01	<0.01	<0.01	1	<0.01	1	None	None	None	None
1-methylcyclopropene	<0.01	<0.01	1	1	<0.01	1	1	1	1	1
1-naphthaleneacetamide	25	20	20	19	22	18	14	11	17	7
2,4-decadienoic acid, ethyl ester, (2e,4z)-	None	None	None	None	<0.01	4	3	3	2	1
2-methyl-1-butanol	None	None	None	<0.01	<0.01	<0.01	<0.01	1	<0.01	1
3,13 octadecadien-1-yl acetate	1	12	None	<0.01	None	<0.01	142	None	None	None
3,7-dimethyl-6-octen-1-ol	23	12	28	54	42	49	72	95	98	70
acetic acid	1,732	73	601	43	62	20,806	9,111	5,357	4,248	1,506
agrobacterium radiobacter	124	919	28	230	271	137	2,561	64	59	248
agrobacterium radiobacter, strain k1026	<0.01	<0.01	<0.01	34	<0.01	<0.01	<0.01	None	None	None
allyl isothiocyanate	None	None	<0.01	None	None	None	<0.01	None	None	<0.01
almond, bitter	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	None	<0.01	<0.01	<0.01
amino ethoxy vinyl glycine hydrochloride	1,024	1,194	1,368	1,444	1,757	2,011	1,380	1,296	2,532	2,983
ammonium bicarbonate	9	14	7	51	34	42	None	None	None	None
ammonium nitrate	40,065	52,072	66,531	86,029	88,037	91,564	89,252	86,912	78,350	84,496
ammonium nonanoate	None	None	None	1,937	3,131	3,399	27,356	19,625	17,272	5,421
ampelomyces quisqualis	<0.01	None	None	None	None	None	None	None	None	None
aspergillus flavus strain af36	None	<0.01	4	4	8	9	14	15	16	18
aureobasidium pullulans strain dsm 14940	None	None	None	81	458	356	1,095	2,493	3,956	2,794
aureobasidium pullulans strain dsm 14941	None	None	None	81	458	356	1,095	2,493	3,956	2,794
azadirachtin	1,890	2,404	4,192	3,387	4,323	5,108	4,774	4,884	4,422	4,572

Chemical	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
bacillus amyloliquefaciens strain d747	None	None	869	84,957	177,589	131,295	209,773	395,706	272,731	298,211
bacillus amyloliquefaciens strain mbi 600	None	None	<0.01	<0.01	None	None	15	79	275	683
bacillus firmus (strain i-1582)	None	None	None	None	42	190	170	212	160	33
bacillus mycoides isolate j	None	None	None	None	None	None	None	1,085	568	531
bacillus popilliae	None	None	None	<0.01	<0.01	<0.01	<0.01	None	<0.01	None
bacillus pumilus, strain qst 2808	6,783	7,571	6,771	6,249	7,957	8,123	7,890	9,239	7,552	7,694
bacillus sphaericus 2362, serotype h5a5b, strain abts 1743 fermentation solids, spores and insecticidal toxins	13,013	10,602	9,123	10,500	10,499	12,357	13,122	16,362	10,811	11,726
bacillus subtilis gb03	<0.01	<0.01	1	1	2	3	3	4	3	3
bacillus subtilis strain iab/bs03	None	None	None	None	None	None	None	None	5	48
bacillus subtilis var. amyloliquefaciens strain fzb24	None	None	2	94	119	178	6	<0.01	None	None
bacillus thuringiensis (berliner)	6	26	18	11	4	29	21	14	17	8
bacillus thuringiensis (berliner), subsp. aizawai, gc-91 protein	20,397	11,666	17,042	13,265	18,776	16,771	18,882	34,178	45,023	54,292
bacillus thuringiensis (berliner), subsp. aizawai, serotype h-7	824	814	714	359	333	184	73	118	48	548
bacillus thuringiensis (berliner), subsp. israelensis, serotype h-14	11,401	22,640	12,632	9,269	11,779	15,761	15,839	17,733	14,245	18,285
bacillus thuringiensis (berliner), subsp. kurstaki strain sa-12	7,424	4,700	10,361	8,311	7,971	8,579	9,804	2,218	563	336
bacillus thuringiensis (berliner), subsp. kurstaki, serotype 3a,3b	150	244	234	53	41	18	34	76	91	27

Chemical	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
bacillus thuringiensis (berliner), subsp. kurstaki, strain eg 2348	66	478	44	500	514	344	645	396	8	<0.01
bacillus thuringiensis (berliner), subsp. kurstaki, strain eg2371	<0.01	<0.01	None	None	None	None	None	None	None	None
bacillus thuringiensis (berliner), subsp. kurstaki, strain sa-11	75,074	115,695	52,422	78,064	80,401	80,953	74,963	96,409	119,097	116,357
bacillus thuringiensis (berliner), subsp. san diego	<0.01	None	None	None	None	None	None	None	None	2
bacillus thuringiensis subspecies kurstaki strain bmp 123	14	None	None	None	None	None	None	None	None	None
bacillus thuringiensis subspecies kurstaki, genetically engineered strain eg7841 lepidopteran active toxin	1	75	298	116	65	3	43	3	1	2,503
bacillus thuringiensis var. kurstaki strain m-200	None	None	None	None	None	<0.01	None	<0.01	1	<0.01
bacillus thuringiensis var. kurstaki, genetically engineered strain eg7826	None	None	528	None	None	None	7	None	15	None
bacillus thuringiensis, subsp. aizawai, strain abts-1857	26,250	24,321	30,649	29,863	49,186	55,914	72,261	92,928	88,725	117,900
bacillus thuringiensis, subsp. aizawai, strain sd-1372, lepidopteran active toxin(s)	130	88	1	18	6	43	13	6	16	2
bacillus thuringiensis, subsp. israelensis, strain am 65-52	71,050	52,787	173,153	49,682	42,763	46,599	70,128	61,729	66,639	56,832
bacillus thuringiensis, subsp. kurstaki, strain abts-351, fermentation solids and solubles	96,988	83,214	95,440	83,415	111,388	95,487	117,902	134,869	121,691	160,628

Chemical	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
bacillus thuringiensis, subsp. kurstaki, strain hd-1	3,589	2,573	3,187	2,323	1,928	1,860	186	111	13	24
bacillus thuringiensis, var. kurstaki delta endotoxins cry 1a(c) and cry 1c (genetically engineered) encapsulated in pseudomonas fluorescens (killed)	<0.01	<0.01	4	None	<0.01	None	<0.01	None	5	None
bacteriophage active against xanthomonas campestris pv. vesicatoria and pseudomonas syringae pv. tomato	None	<0.01	<0.01	<0.01	<0.01	None	None	<0.01	None	<0.01
balsam fir oil	<0.01	None	<0.01	<0.01	<0.01	1	<0.01	None	<0.01	<0.01
beauveria bassiana hf 23	None	None	None	None	None	None	37	55	67	71
beauveria bassiana strain gha	357	622	1,220	1,796	2,749	3,511	2,850	5,690	7,040	6,183
beta-conglutin	None	None	None	None	None	6,762	6,099	7,383	4,314	2,887
buffalo gourd root powder	11	None	1	25	5	6	8	3	73	33
burkholderia sp strain a396 cells and fermentation media	None	None	None	None	2,829	58,593	53,655	115,528	216,384	412,529
butyl mercaptan	None	None	<0.01	None	None	None	None	None	None	None
calcium salts of phosphorous acid	None	None	None	None	None	None	None	None	None	<0.01
canola oil	131	26	15	28	61	97	247	286	2,175	2,833
capsicum oleoresin	4	4	12	10	27	92	125	203	635	409
carbon dioxide	17,550	21,239	42,612	21,186	18,297	17,675	25,366	26,359	36,307	73,104
castor oil	7	<0.01	2	<0.01	8	<0.01	4	None	3	None
chenopodium ambrosioides near ambrosioides	10,336	7,897	10,231	20,267	17,504	12,828	10,207	8,300	387	186
chromobacterium subtsugae strain praa4-1	None	None	1,169	30,262	46,419	45,894	31,445	36,395	42,933	38,877
cinnamaldehyde	None	1	None	None	None	None	None	59	1	None
citral	<0.01	None	None	None	None	None	None	None	None	None
citric acid	74,576	92,556	94,969	128,806	114,940	126,174	142,111	136,398	152,409	165,577

Chemical	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
clarified hydrophobic extract of neem oil	115,931	71,739	78,007	119,298	197,351	222,694	166,062	173,113	138,380	138,593
codling moth granulosis virus	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
coniothyrium minitans strain con/m/91-08	80	176	245	611	641	786	657	665	424	216
corn syrup	3,026	4,377	4,766	3,216	3,344	4,342	4,850	14,787	22,767	18,251
cottonseed oil	153,038	318,868	114,610	105,083	132,464	87,451	55,082	45,678	35,072	39,588
coyote urine	<0.01	1	2	3	9	6	3	6	3	3
cytokinin (as kinetin)	None	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
diallyl disulfide	None	None	None	None	None	None	103	94	None	None
dihydro-5-heptyl-2(3h)-furanone	<0.01	None	None	None	None	None	None	None	None	<0.01
dihydro-5-pentyl-2(3h)-furanone	<0.01	None	None	None	None	None	None	None	None	<0.01
e,e-8,10-dodecadien-1-ol	1,942	1,376	1,995	2,276	1,395	1,445	1,079	5,420	1,209	862
e-11-tetradecen-1-yl acetate	100	172	133	142	61	73	32	294	40	8
e-8-dodecenyl acetate	898	195	283	273	224	769	390	1,714	271	322
encapsulated delta endotoxin of bacillus thuringiensis var. kurstaki in killed pseudomonas fluorescens	None	1	<0.01	None	None	None	None	None	None	None
essential oils	<0.01	<0.01	1	<0.01	15	12	20	24	11	7
ethylene	97	1,018	954	1,359	1,333	1,683	1,299	1,248	953	1,021
eucalyptus oil	22	<0.01	None	None	None	None	None	None	None	None
eugenol	None	None	1	<0.01	1	<0.01	1	<0.01	<0.01	None
farnesol	10	5	11	21	17	20	29	38	39	28
fenugreek	1	5	8	2	1	7	None	<0.01	10	<0.01
ferric sodium edta	None	1,979	6,351	5,855	6,790	8,000	12,449	12,329	8,118	8,568
fish oil	None	1,657	5,466	4,114	None	None	1,078	None	None	None
formic acid	223	241	634	66	337	2,606	1,243	984	1,647	351
fox urine	<0.01	<0.01	2	1	4	3	1	4	2	1
gamma aminobutyric acid	118	40	133	42	15	15	None	None	None	None
garlic	423	29	1,905	2,832	1,392	667	849	529	1,127	1,098
geraniol	23	12	28	54	42	49	72	95	98	70
german cockroach pheromone	<0.01	<0.01	<0.01	<0.01	<0.01	None	<0.01	<0.01	<0.01	<0.01
gibberellins	21,737	23,717	24,216	41,418	27,422	27,409	23,142	27,104	28,654	25,378

Chemical	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
gibberellins, potassium salt	<0.01	<0.01	5	None	None	None	None	1	None	None
gliocladium virens gl-21 (spores)	945	649	1,957	3,538	2,989	4,586	4,395	2,829	2,707	1,218
glutamic acid	118	40	133	42	15	15	None	None	None	None
gs-omega/kappa-hxtx-hv1a (versitide peptide)	None	None	None	None	None	None	<0.01	None	3	22
harpin protein	13	11	1	1	<0.01	None	<0.01	<0.01	None	None
heptyl butyrate	<0.01	<0.01	<0.01	14	6	4	3	13	4	28
hydrogen peroxide	69,179	59,387	36,310	47,239	49,826	74,419	130,417	312,065	355,410	460,682
hydroprene	6,382	11,261	3,948	7,352	5,734	6,456	3,920	3,155	2,923	3,989
iba	7	9	12	15	14	13	10	19	17	29
indole	None	None	None	<0.01	None	<0.01	<0.01	<0.01	<0.01	<0.01
iron hedta	None	None	43	92	120	91	170	213	113	157
iron phosphate	2,351	2,874	2,327	2,119	2,007	2,071	2,250	3,482	2,837	3,211
kaolin	3,040,482	1,686,874	2,014,970	2,473,768	2,854,542	3,411,740	3,591,408	3,193,218	3,269,120	2,720,806
kinoprene	3	9	3	8	33	17	10	1	<0.01	<0.01
lactic acid	None	None	None	None	None	2	3	12	10	15
lactose	7,984	9,374	6,554	7,143	6,616	7,855	8,501	8,889	7,949	8,186
lagenidium giganteum (california strain)	None	None	5	None	None	None	None	None	None	None
lauryl alcohol	736	497	755	449	293	501	319	2,566	309	229
lavandulyl senecioate	437	6,120	586	477	3,166	507	1,035	1,312	2,282	4,187
limonene	56,406	62,925	74,369	61,334	68,137	72,906	67,550	92,320	106,974	56,870
linalool	1,104	95	136	72	62	93	15	11	2	1
margosa oil	579	7,886	9,106	12,189	22,585	26,019	32,493	25,061	13,756	41,098
menthol	5	<0.01	None	20	None	None	None	None	None	None
metarhizium anisopliae strain f52	None	None	116	89	121	20	54	2	1	1
metarhizium anisopliae, var. anisopliae, strain esf1	<0.01	<0.01	None	None	None	None	None	None	None	None
methoprene	1,492	1,809	1,304	1,350	3,556	1,390	1,271	1,064	764	801
methyl anthranilate	343	448	300	1,237	634	672	789	1,118	958	1,208
methyl eugenol	None	5	None	9	None	None	126	386	1,149	1,138
methyl nonyl ketone	<0.01	None	None	<0.01	<0.01	<0.01	<0.01	<0.01	1	<0.01
methyl salicylate	None	None	None	None	None	None	None	<0.01	<0.01	None
muscalure	15	15	16	13	17	23	29	44	60	18
myristyl alcohol	150	102	155	91	60	102	65	520	63	47

Chemical	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
myrothecium verrucaria, dried fermentation solids & solubles, strain aarc-0255	22,813	27,757	25,556	26,005	17,675	30,810	26,033	22,923	23,021	21,639
n6-benzyl adenine	217	129	168	183	184	230	221	161	198	477
naa	5	4	9	15	12	18	11	100	11	14
naa, ammonium salt	976	839	1,400	1,056	945	996	125	181	335	249
naa, ethyl ester	6	23	4	3	5	3	38	10,502	13,162	13,844
naa, potassium salt	None	None	None	53	15	2	934	1,017	607	613
naa, sodium salt	None	None	None	2	1	<0.01	<0.01	None	None	1
natamycin	None	None	None	<0.01	1	1	1	<0.01	None	96
nerolidol	24	12	28	54	42	49	72	95	98	70
nitrogen, liquefied	135	216	74	594	6	None	None	None	None	None
nonanoic acid	17,322	17,939	18,200	21,545	17,530	14,482	13,301	14,610	12,755	12,280
nonanoic acid, other related	912	944	958	1,134	923	762	700	769	671	645
nosema locustae spores	<0.01	<0.01	1	<0.01	<0.01	<0.01	1	<0.01	<0.01	None
oil of anise	None	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
oil of black pepper	<0.01	<0.01	<0.01	1	1	<0.01	<0.01	<0.01	<0.01	<0.01
oil of cedarwood	<0.01	None	None	None	None	<0.01	<0.01	None	None	None
oil of citronella	5	46	None	None	1	5	<0.01	1	<0.01	1
oil of geranium	<0.01	None	None	None	None	None	None	None	None	None
oil of jojoba	4,176	1,232	507	135	376	44	19	2	None	12
oil of lemon eucalyptus	None	<0.01	3	None	None	None	None	None	None	None
oil of orange	None	None	None	None	None	198	386	1,360	479	486
oil of peppermint	<0.01	None	None	None	None	None	None	None	None	None
oxypurinol	None	None	None	None	<0.01	None	None	None	None	None
paecilomyces fumosoroseus apopka strain 97	None	None	508	3,302	5,951	5,624	8,947	8,659	5,100	8,341
pantoea agglomerans strain e325, nrrl b-21856	4	1	1	1	None	None	None	None	None	None
phenylethyl propionate	822	423	535	701	712	185	96	140	34	20
phosphoric acid, monopotassium salt	6,984	9,079	3,927	1,918	374	9,585	15,002	11,445	10,125	3,350
piperine	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Chemical	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
polyhedral occlusion bodies (ob's) of the nuclear polyhedrosis virus of helicoverpa zea (corn earworm)	1	51	6	1	2	4	20	41	41	22
polyoxin d, zinc salt	1,296	3,519	4,738	6,731	7,412	8,613	10,308	10,653	11,420	13,108
potassium bicarbonate	275,648	358,917	229,238	239,909	223,547	318,099	462,830	489,086	350,282	468,514
potassium phosphite	287,730	279,964	281,901	390,547	708,940	666,576	952,539	1,167,494	1,205,218	1,651,325
potassium silicate	39	1,412	988	5,407	23,582	36,525	25,901	33,039	13,821	28,004
potassium sorbate	65	None	None	None	None	None	None	None	None	None
propylene glycol	54,233	50,584	60,679	86,335	90,353	87,138	91,163	103,909	108,296	122,111
propyleneglycol monolaurate	12	None	None	203	44	None	None	None	None	None
pseudomonas fluorescens, strain a506	217	274	59	92	270	87	123	111	113	66
pseudomonas syringae, strain esc-10	<0.01	None	None	3	None	None	None	None	None	None
purpureocillium lilaciunum strain 251	252	515	840	4,073	5,031	6,408	6,273	5,474	3,817	2,872
putrescent whole egg solids	3	1	1	1	1	1	6	5	6	2
pythium oligandrum dv74	None	<0.01	<0.01	<0.01	None	None	None	None	None	None
qst 713 strain of dried bacillus subtilis	21,464	23,965	23,645	24,605	20,969	20,916	21,063	21,952	21,275	25,388
quillaja	682	1,081	785	1,040	775	829	1,027	1,385	1,452	1,636
reynoutria sachalinensis	8,996	14,844	14,803	15,355	16,105	18,358	23,508	23,644	20,078	23,075
s-abscisic acid	865	1,854	2,651	2,131	2,382	2,114	2,192	2,220	1,861	1,856
s-methoprene	3,921	2,313	2,324	2,331	2,524	2,781	3,220	3,133	4,077	11,536
sawdust	1	None	4	4	None	None	1	None	None	None
sesame oil	1,309	1,327	15	<0.01	None	None	None	None	2	None
silver nitrate	<0.01	<0.01	<0.01	None	None	None	<0.01	<0.01	None	<0.01
sodium bicarbonate	3	515	146	44	479	420	13,604	3,679	3	None
sodium carbonate peroxyhydrate	101,714	298,763	300,693	295,762	463,448	244,233	261,347	165,621	329,252	276,479
sodium chloride	2	169	111	119	211	216	128	81	110	147
sodium lauryl sulfate	96	458	884	431	570	1,749	507	1,200	1,330	1,148
sorbitol octanoate	None	35	None	None	None	None	None	<0.01	None	None
soybean oil	24,110	24,109	22,065	45,973	59,297	69,771	84,295	80,999	82,172	70,158
streptomyces griseoviridis strain k61	<0.01	<0.01	<0.01	10	11	18	5	4	2	1

Chemical	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
streptomyces lydicus wyec 108	2	1	2	3	3	3	4	3	2	3
sucrose octanoate	1,128	230	55	188	98	203	29	7	None	None
sugar	1,122	448	1,240	51	16	60	667	4	20	775
thyme	1,311	665	844	1,135	1,150	257	122	181	25	11
thyme oil	None	None	None	None	None	1	3	12	7	7
thymol	1,539	265	181	398	314	278	570	564	669	162
trichoderma harzianum rifai strain krl-ag2	504	129	158	186	86	65	112	64	86	95
trichoderma icc 012 asperellum	None	13	19	43	2	2	9	4	1	32
trichoderma icc 080 gamsii	None	13	19	43	2	2	9	4	1	32
trimethylamine	None	None	None	<0.01	None	<0.01	<0.01	<0.01	<0.01	<0.01
ulocladium oudemansii (u3 strain)	None	None	None	29	792	516	155	34	2,131	1,431
vanillin	<0.01	1	1	<0.01	<0.01	1	None	<0.01	2	<0.01
vegetable oil	323,401	514,884	276,278	315,218	267,446	485,628	517,951	665,926	827,913	668,393
xanthine	None	None	None	None	<0.01	None	None	None	None	None
yeast	470	1,165	818	80	32	86	14	4	12	<0.01
yucca schidigera	634	1,649	7,147	12,327	5,652	2,565	3,130	2,173	5,733	6,750
z,e-9,12-tetradecadien-1-yl acetate	1	7	6	14	122	20	10	21	62	159
z-11-tetradecen-1-yl acetate	9	4	8	8	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
z-8-dodecenol	157	34	48	44	38	98	60	201	47	52
z-8-dodecenyl acetate	13,964	3,010	4,005	3,467	3,248	4,461	4,300	6,479	4,158	4,028
Total	5,150,319	4,439,952	4,320,457	5,091,003	6,167,978	6,882,943	7,690,024	8,119,116	8,397,346	8,637,854