

Use Trends of Biopesticides: Cumulative Acres Treated

[Text files](#) of data are available. The reported cumulative acres treated with biopesticides. Biopesticides include naturally occurring substances that control pests (biochemical pesticides) and microorganisms that control pests (microbial pesticides). The definition may also include new technologies that do not easily fit into one of those two categories. Acres treated totals are cumulative, meaning that if a one-acre field was treated three times in a year, the cumulative acres treated would equal three acres. Cumulative acres treated totals include pesticide use reports (PURs) with unit treated equal to acres (A) or square feet (S), the latter of which was converted to acres. PURs with volume (cubic feet, etc.), weight (tons, lbs, etc.), or miscellaneous units (bins, holes, etc.) are not included in the acres treated totals. Most nonagricultural PURs are not required to report acres treated, so the acres treated totals are predominantly agricultural pesticide uses. If pounds were reported for a year but acres treated is zero, then the pesticide use was non-agricultural. The total for acres treated may be less than the sum of the table rows because the total is adjusted to prevent the overcounting of acreage for pesticide products with more than one active ingredient. Values greater than one are rounded. For more information, see Pesticide Use Annual Report Data Access, References, and Definitions [Guide](#).

Chemical	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
(3s,6r)-3-methyl-6-isopropenyl-9-decen-1-yl acetate	24	0	215	8,683	35,138	58,613	59,905	60,468	60,617	65,647
(3s,6s)-3-methyl-6-isopropenyl-9-decen-1-yl acetate	24	0	215	8,683	35,138	58,613	59,905	60,468	60,617	65,647
(e)-4-tridecen-1-yl-acetate	1,074	0	0	0	0	11	10	0	0	0
(e)-5-decen-1-ol	659	514	721	1,179	1,379	1,658	1,646	688	1,074	1,373
(e)-5-decenyl acetate	659	514	721	1,179	1,379	1,658	1,646	688	1,074	1,373
(e,e)-8,10-dodecadien-1-ol	13,556	9,733	12,418	16,774	15,777	15,437	16,180	14,787	13,821	16,191
(e,e)-9,11-tetradecadien-1-yl acetate	355	543	264	263	341	51	110	57	21	< 1
(e,z)-7,9-dodecadienyl acetate	1,623	0	0	0	0	0	0	0	0	0
(s)-kinoprene	771	997	694	679	877	967	1,015	791	612	756
(s)-verbenone	0	0	0	2	1	0	0	0	0	50
(z)-11-hexadecen-1-yl acetate	0	0	26	2,994	1,807	3,955	3,754	13,451	21,661	16,829

Chemical	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
(z)-11-hexadecenal	0	74	145	2,951	1,351	876	3,754	12,762	21,651	16,829
(z)-4-tridecen-1-yl-acetate	1,074	0	0	0	0	11	10	0	0	0
(z)-9-dodecenyl acetate	1,966	950	0	0	0	0	0	0	0	0
(z,e)-7,11-hexadecadien-1-yl acetate	0	0	0	0	0	0	16	0	0	0
(z,z)-11,13-hexadecadienal	38,681	61,037	66,068	67,233	89,479	186,467	175,122	196,805	213,534	338,577
(z,z)-3,13-octadecadien-1-ol acetate	0	10	25	0	0	0	0	0	0	0
(z,z)-7,11-hexadecadien-1-yl acetate	0	0	0	0	0	0	16	0	0	0
1,4-dimethylnaphthalene	0	0	0	0	0	0	0	0	0	0
1,7-dioxaspiro-(5,5)-undecane	25	32	0	0	0	0	0	0	0	0
1-methylcyclopropene	14	10	6	13	5	4	2	1	2	2
2,4-decadienoic acid, ethyl ester, (2e,4z)-	179	3,246	1,308	1,014	582	1,609	1,167	278	322	1,641
2-methyl-1-butanol	0	0	0	0	0	0	0	0	0	0
3,7-dimethyl-6-octen-1-ol	3,545	3,111	4,331	5,936	5,749	4,265	3,707	3,631	2,328	1,419
3-decen-2-one	0	0	0	0	0	0	0	0	0	0
Acetic acid	10,301	15,815	10,437	18,729	13,906	15,506	8,018	7,569	2,529	31
Aggregated adjuvant data	339	21,806	37,831	66,373	54,076	47,480	45,850	28,803	20,762	31,672
Agrobacterium radiobacter strain: k1026	754	745	< 1	0	0	0	0	0	0	0
Agrobacterium radiobacter strain: k84	664	806	613	99	570	246	89	170	380	240

Chemical	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Albifimbria verrucariisolids and solubles strain: aarc-0255	3,637	8,775	6,473	4,075	5,037	4,966	3,720	1,801	2,612	355
Allyl isothiocyanate	0	0	0	0	0	0	0	0	0	0
Aminoethoxyvinylglycine hydrochloride	17,666	20,248	14,254	13,067	25,478	32,244	32,205	22,356	18,925	11,491
Ammonium bicarbonate	25	32	0	0	0	0	0	0	0	0
Ammonium nitrate	953,176	988,882	882,616	830,497	741,547	676,471	652,453	644,413	539,306	557,828
Ammonium nonanoate	284	452	459	320	455	529	719	573	1,633	390
Aspergillus flavus strain: af-36	147,011	159,586	183,128	188,090	207,315	220,108	250,238	304,365	270,857	118,871
Aureobasidium pullulans subspecies pullulans dsm # 14940	2,823	1,569	5,376	8,675	18,112	12,117	11,353	10,582	7,097	3,336
Aureobasidium pullulans subspecies pullulans dsm # 14941	2,823	1,569	5,376	8,675	18,112	12,117	11,353	10,582	7,097	3,336
Azadirachtin	159,292	194,100	175,629	175,709	151,565	159,081	195,339	206,177	213,047	164,143
Bacillus altitudinis strain: qst 2808	83,406	89,494	83,285	95,326	84,837	86,122	109,660	94,727	75,445	74,908
Bacillus amyloliquefaciens strain: f727	0	0	0	0	0	0	7,568	3,557	5,819	16,626
Bacillus firmus strain: i-1582	12	45	41	43	29	5	6	0	6	0
Bacillus mycoides isolate j	0	0	0	11,591	5,455	6,024	4,914	2,770	3,396	3,066
Bacillus popilliae	0	0	0	0	0	0	0	0	0	0
Bacillus sphaericus 2362 serotype h5a5b strain: abts 1743	110	118	233	542	0	1,848	608	548	1,288	42

Chemical	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Bacillus subtilis subspecies subtilis strain: iab/bs03	0	0	0	0	3,277	13,910	11,465	18,557	24,727	24,313
Bacillus subtilis var. amyloliquefaciens strain fzb24	3,516	4,328	152	0	0	0	0	0	0	406
Bacillus thuringiensis (berliner)	33	54	157	559	153	50	53	92	103	438
Bacillus thuringiensis (berliner), subsp. aizawai, serotype h-7	2,941	1,360	624	1,025	451	3,146	387	584	362	264
Bacillus thuringiensis (berliner), subsp. kurstaki, serotype 3a,3b	363	152	314	597	1,337	332	12	25	22	75
Bacillus thuringiensis (berliner), subsp. kurstaki, strain sa-11	80,907	79,130	69,697	63,724	76,889	85,700	100,368	87,228	86,832	64,790
Bacillus thuringiensis (berliner), subsp. san diego	0	0	0	0	0	0	0	0	0	0
Bacillus thuringiensis subsp. aizawai strain: abts-1857	68,895	70,658	86,966	111,201	104,954	141,820	150,009	172,660	191,325	174,770
Bacillus thuringiensis subsp. aizawai strain: gc-91	28,611	26,190	25,247	49,005	54,008	64,108	68,567	68,932	79,178	42,279
Bacillus thuringiensis subsp. aizawai strain: sd-1372, lepidopteran active toxins	47	306	120	77	118	18	2	26	27	51
Bacillus thuringiensis subsp. israelensis strain: am 65-52	2,624	2,115	1,652	1,630	1,064	3,582	6,569	4,062	2,742	2,715

Chemical	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Bacillus thuringiensis subsp. kurstaki delta endotoxin protein (crya(c)), genetically engineered in kill pseudomonas fluorescens	0	0	0	0	2	0	0	0	0	0
Bacillus thuringiensis subsp. kurstaki strain: abts-351	196,640	155,834	198,543	236,700	215,172	249,437	199,506	210,217	168,614	211,462
Bacillus thuringiensis subsp. kurstaki strain: eg2438	0	0	0	0	0	0	0	0	0	0
Bacillus thuringiensis subsp. kurstaki strain: eg7826, genetically engineered	0	0	9	0	37	0	0	0	0	0
Bacillus thuringiensis subsp. kurstaki strain: eg7841 , genetically engineered	99	116	473	8	3	4,205	21,591	30,303	18,932	5,129
Bacillus thuringiensis subsp. kurstaki strain: m-200	0	0	0	1	0	< 1	0	0	0	0
Bacillus thuringiensis subsp. kurstaki strain: sa-12	41,477	40,176	39,654	61,641	58,563	46,929	63,171	54,371	47,931	38,637
Bacillus thuringiensis subspecies israelensis strain bmp 144	1,154	1,607	101	294	149	1,424	763	381	444	154
Bacillus thuringiensis subspecies kurstaki strain bmp 123	0	0	0	0	0	0	12	0	0	0
Bacillus thuringiensis, subsp. kurstaki, strain hd-1	7,887	10,593	1,361	895	141	224	137	259	199	368

Chemical	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Bacillus velensis strain: qst 713	137,992	140,862	130,217	128,154	145,009	178,773	153,033	145,837	120,033	135,612
Bacillus velezensis strain: d747	41,678	38,591	57,375	90,617	68,143	77,315	62,680	58,186	58,622	52,545
Bacillus velezensis strain: gb03	302	467	609	2,293	1,473	972	180	128	145	51
Bacillus velezensis strain: mbi 600	0	0	165	1,607	4,793	13,866	23,662	26,633	53,835	45,017
Bacteriophage active against pseudomonas syringae pathovar tomato	12	0	0	< 1	0	9	15	0	0	35
Bacteriophages active against xylella fastidiosa	0	0	0	0	0	0	25	17	36	53
Balsam fir oil	0	0	0	0	0	0	0	0	0	0
Beauveria bassiana hf23	0	0	32	69	81	96	131	101	96	76
Beauveria bassiana strain: ant-03	0	0	0	0	0	0	1,182	4,606	5,451	3,874
Beauveria bassiana strain: gha	10,900	14,377	11,145	16,957	17,983	14,720	22,405	22,690	28,677	24,850
Beauveria bassiana strain: ppri 5339	0	0	0	0	0	131	622	629	434	375
Beta-conglutin	0	9,032	12,422	15,510	9,584	6,803	9,778	13,117	25,012	47,602
Burkholderia rinojensis strain a396	196	5,531	6,816	17,303	35,117	85,132	98,846	88,863	116,203	111,668
Calcium acetate	0	0	0	0	0	0	0	0	0	0
Calcium salts of phosphorous acid	0	0	0	0	0	< 1	0	452	0	< 1
Canola oil	4,272	7,455	20,351	47,851	75,266	61,484	52,460	37,044	37,259	29,085
Capsicum oleoresin	1,541	1,997	2,084	3,777	6,459	4,937	4,314	2,998	2,760	4,283

Chemical	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Castor oil	0	0	0	0	< 1	0	10	0	4	0
Cerevisane (cell walls of saccharomyces cerevisiae strain las117)	0	0	0	0	0	0	0	0	386	14,296
Chromobacterium subtsugae strain: praa4-1	61,191	62,747	43,390	48,875	55,891	54,465	48,885	39,267	44,619	47,391
Cinnamaldehyde	0	0	0	110	< 1	0	8,454	6,980	3,450	8,024
Citric acid	1,686,277	1,923,716	2,202,490	2,158,349	2,189,919	2,350,501	2,327,071	2,193,790	2,292,807	2,370,487
Clarified hydrophobic extract of neem oil	85,369	88,106	65,755	59,527	47,140	52,577	52,453	27,810	13,314	22,585
Clove oil	0	0	0	0	0	0	54	0	0	0
Coniothyrium minitans strain: con/m/91-08	4,886	6,194	4,104	5,159	3,250	1,978	4,891	4,291	7,207	3,275
Corn syrup	14,206	18,817	18,940	48,910	74,221	63,679	50,796	35,515	48,987	49,259
Cottonseed oil	78,736	67,349	41,034	36,856	35,581	32,024	15,258	14,019	8,080	4,519
Coyote urine	0	0	0	0	0	0	0	0	0	0
Cydia pomonella granulosus virus	4,530	3,683	2,938	4,426	4,922	5,417	6,827	4,860	2,856	3,427
Cytokinin (as kinetin)	3,290	1,966	1,910	3,506	5,052	1,159	115	1,135	38	157
Diallyl disulfide	0	0	225	222	0	0	85	0	0	0
Dihydro-5-heptyl-2(3h)-furanone	0	0	0	0	0	3	0	0	0	0
Dihydro-5-pentyl-2(3h)-furanone	0	0	0	0	0	3	0	0	0	0
Dysphania ambrosioides	25,820	19,072	15,804	15,002	635	267	93	196	25	2,026
E-11-tetradecen-1-yl acetate	378	594	284	902	398	556	1,750	154	2,745	1,111
E-8-dodecenyl acetate	44,398	43,675	40,138	38,664	42,192	46,318	43,447	40,828	39,548	46,259

Chemical	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Essential oils	0	0	0	61	77	24	32	30	0	0
Ethylene	21	28	77	26	17	16	13	25	18	28
Eugenol	0	0	0	0	0	0	0	0	0	0
Farnesol	3,547	3,121	4,331	5,936	5,749	4,265	3,707	3,631	2,328	1,419
Ferric sodium edta	10,540	12,522	13,115	13,697	14,410	11,981	8,557	6,778	5,922	8,816
Formic acid	178	1,203	60	1	402	0	0	4	300	< 1
Fox urine	0	0	0	0	0	0	0	0	0	0
Gamma aminobutyric acid	314	287	0	0	0	0	0	0	0	0
Garlic	8,509	4,767	7,185	3,819	6,615	8,091	6,881	5,001	2,665	5,243
Geraniol	3,545	3,111	4,331	5,936	5,749	4,265	3,707	3,631	2,328	1,419
German cockroach pheromone	0	0	0	0	0	0	0	0	0	0
Gibberellins	530,086	523,059	544,818	501,854	506,607	583,798	507,833	486,490	467,777	425,563
Gibberellins, potassium salt	0	0	0	58	0	0	0	0	0	0
Glutamic acid	314	287	0	0	0	0	0	0	0	0
Gs-omega/kappa-hxtx-hv1a, versitide peptide	0	0	1	0	< 1	324	36,966	81,942	130,704	174,710
Harpin protein	< 1	0	112	< 1	0	0	0	17	376	2,321
Heptyl butyrate	0	0	0	0	0	0	0	0	0	0
Hydrogen peroxide	27,937	32,676	69,022	65,570	103,675	299,206	201,078	366,292	200,473	360,727
Hydroprene	< 1	< 1	7	28	35	31	9	15	4	< 1
Hypocrea (teleomorph)	35	251	159	92	139	444	650	2,524	3,737	11,651
Hypocrea atroviridis	35	251	159	92	139	444	650	2,524	3,737	11,651
Iba	940	489	808	1,437	528	813	890	1,074	2,183	1,790
Indole	0	0	0	0	0	0	0	0	0	0
Iron hedta	0	0	0	2	0	0	0	0	0	20,291
Iron phosphate	8,109	8,618	13,322	11,992	9,259	10,469	12,748	9,590	12,506	11,468

Chemical	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Isaria fumosorosea apopka strain: 97	18,487	19,113	31,000	26,577	15,462	23,738	25,222	17,308	3,367	5,129
Isaria fumosorosea strain: fe 9901	0	0	0	0	0	0	0	9	1,038	1,005
Kaolin	88,044	101,645	115,467	103,356	99,096	80,707	79,910	71,911	77,849	91,482
Kinoprene	4	0	0	< 1	0	0	0	1	< 1	0
Lactic acid	0	0	59	225	0	99	83	78	14	0
Lactose	61,764	81,390	77,746	74,127	70,431	72,066	65,994	66,733	65,537	76,824
Laminarin	0	0	0	0	0	0	707	4,107	5,961	3,463
Lauryl alcohol	5,681	5,725	4,718	4,354	4,793	3,756	5,059	5,358	4,732	4,102
Lavandulyl senecioate	6,294	8,424	18,076	74,825	141,767	194,088	179,933	208,421	221,965	208,364
Limonene	32,924	45,208	40,224	68,084	54,171	47,966	47,160	29,403	21,170	32,468
Linalool	2	0	0	0	0	0	0	0	0	0
Margosa oil	19,013	19,940	25,805	32,268	23,524	37,578	37,380	38,885	43,256	45,262
Metarhizium robertsii strain: f52	634	122	55	2	< 1	1	< 1	0	0	278
Methoprene	0	0	0	12	0	0	2	2	2	< 1
Methyl anthranilate	808	895	1,463	2,490	2,041	1,908	2,933	2,879	3,692	3,606
Methyl eugenol	0	0	0	0	0	0	0	0	0	0
Methyl nonyl ketone	0	0	0	0	0	0	0	0	0	0
Methyl salicylate	0	0	0	10	44	0	0	144	0	36
Muscalure	139	41	19	178	125	36	24	25	19	16
Muscodor albus strain: sa13	0	0	0	0	0	0	135	0	0	0
Myristyl alcohol	5,681	5,725	4,718	4,354	4,793	3,756	5,059	5,358	4,732	4,102
N6-benzyl adenine	2,630	2,595	2,999	2,322	3,160	5,412	3,770	3,516	3,610	5,635
Natamycin	32	35	27	5	0	90	113	3	173	110
Nerolidol	3,547	3,121	4,331	5,936	5,749	4,265	3,707	3,631	2,328	1,419
Nitrogen, liquified	5	0	0	0	0	0	0	0	0	22

Chemical	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Nonanoic acid	2,078	1,040	653	1,889	1,375	628	406	1,189	1,074	1,027
Nonanoic acid, other related	2,074	1,040	653	1,219	600	488	396	276	380	189
Nosema locustae spores	910	750	50	< 1	1	0	116	< 1	0	0
Oil of anise	0	0	0	0	0	0	0	0	0	0
Oil of black pepper	0	0	0	0	0	0	0	0	0	0
Oil of cedarwood	0	0	0	0	0	0	0	0	0	0
Oil of citronella	0	0	0	0	0	0	0	0	0	< 1
Oil of jojoba	323	83	16	5	0	0	0	0	0	0
Oil of orange	0	0	0	0	0	0	0	0	0	0
Oxypurinol	6	0	0	0	0	0	0	0	0	0
Phenylethyl propionate	0	0	0	0	0	0	0	0	0	0
Phosphoric acid, monopotassium salt	0	1,837	3,142	2,284	2,025	570	62	0	0	0
Piperine	0	0	0	0	0	0	0	0	0	0
Polyhedral occlusion bodies (obs') of helioverpa zea (corn earworm) nucleopolyhedrovirus strain: aba-npv-u	518	1,011	4,902	8,857	8,803	4,958	7,220	9,616	9,876	12,308
Polyoxin d, zinc salt	165,601	191,654	231,715	242,568	264,129	305,573	268,143	230,179	221,789	334,457
Potassium bicarbonate	85,701	112,128	156,482	162,481	125,421	265,553	106,704	72,249	88,251	181,793
Potassium phosphite	214,917	199,792	299,792	387,641	411,327	545,140	468,000	418,927	419,329	485,579
Potassium silicate	12,973	13,519	12,133	14,938	8,226	12,925	20,729	16,592	14,293	11,974
Potassium sorbate	0	0	0	0	0	0	0	0	0	0
Propyleneglycol monolaurate	76	0	0	0	0	0	0	0	0	0

Chemical	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Pseudomonas chlororaphis subsp. aurantiaca strain: afs009	0	0	0	0	0	0	1,093	4,671	15,431	21,517
Pseudomonas fluorescens, strain a506	1,178	376	601	524	533	328	167	218	146	687
Purpureocillium lilacinum strain 251	25,826	32,089	26,924	22,752	15,917	11,461	12,699	12,506	12,358	10,886
Putrescent whole egg solids	0	0	0	0	0	0	0	0	0	0
Quillaja	30,232	31,107	53,339	53,857	69,345	54,788	34,058	17,269	7,208	2,222
Reynoutria sachalinensis (giant knotweed) plant extract	95,988	105,565	128,059	125,137	112,110	140,062	136,545	104,808	80,316	101,122
S-abscisic acid	12,761	11,202	11,471	12,079	8,770	7,937	6,772	8,543	5,952	4,859
S-methoprene	53,371	102,139	77,003	54,058	71,339	106,476	120,583	67,166	92,136	46,832
Sawdust	0	0	160	0	0	0	0	300	72	201
Silver nitrate	0	0	< 1	< 1	0	2	2	121	34	69
Sodium bicarbonate	544	706	796	162	< 1	0	0	0	0	0
Sodium chloride	135	66	134	144	42	100	75	35	31	< 1
Sodium lauryl sulfate	0	0	0	0	0	0	0	0	0	0
Sodium percarbonate	17,035	8,051	10,137	7,129	12,824	12,052	13,308	12,227	12,251	15,802
Sorbitol octanoate	0	0	0	< 1	0	0	0	< 1	0	0
Soybean oil	6,275	5,476	7,018	7,910	18,460	29,903	29,024	29,126	18,428	43,462
Streptomyces lydicus strain: wyec 108	14,050	16,583	20,493	15,970	10,221	15,115	11,087	8,453	9,313	6,624
Streptomyces griseoviridis strain k61	10	18	5	4	5	2	< 1	< 1	2	8
Sucrose octanoate	10	2	12	0	0	0	0	0	0	0
Sugar	1,427	452	504	86	212	160	57	194	47	43

Chemical	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Swinglea glutinosa extract	0	0	0	0	0	0	4	12,413	8,733	6,210
Tea tree oil	0	0	0	0	0	0	0	29	26	32
Thyme oil	0	0	0	0	0	0	0	0	0	0
Thymol	1	1,267	490	44	311	608	12,000	86	34	32
Trichoderma harzianum rifai strain krl-ag2	2,507	2,346	2,207	2,244	2,404	2,412	1,629	1,657	3,089	5,005
Trichoderma virens strain: gl-21	5,187	7,439	7,140	4,914	4,300	2,396	168	48	2	278
Trimethylamine	0	0	0	0	0	0	0	0	0	0
Ulocladium oudemansii (u3 strain)	707	406	150	28	1,674	1,178	715	460	265	308
Vegetable oil	243,680	311,693	405,341	603,909	584,960	513,784	396,500	323,694	330,777	341,573
Xanthine	6	0	0	0	0	0	0	0	0	0
Yeast	0	220	25	6	14	0	0	34	0	41
Yucca, extract	11,285	7,347	9,376	6,289	10,926	14,716	12,054	9,877	20,759	6,697
Z,e-9,12-tetradecadien-1-yl acetate	0	0	0	43	506	3,079	0	689	10	0
Z-11-tetradecen-1-yl acetate	23	51	20	639	57	506	1,639	97	2,724	1,111
Z-8-dodecenol	44,398	43,675	40,138	38,664	42,192	46,318	43,447	40,828	39,548	46,259
Z-8-dodecenyl acetate	44,398	43,675	40,138	38,664	42,192	46,318	43,447	40,828	39,548	46,259
Total	5,865,739	6,394,361	6,936,805	7,384,758	7,489,692	8,521,274	7,980,469	7,728,566	7,597,632	8,070,665