NJ Department of Environmental Protection
Division of Compliance & Enforcement
Office of Pesticide Evaluation & Monitoring

AGRICULTURAL PESTICIDE USE IN NEW JERSEY: 2015 SURVEY

Introduction

The New Jersey Office of Pesticide Evaluation & Monitoring (OPEM) began a series of pesticide use surveys in 1985. These surveys address pesticide use in the state of New Jersey for agriculture, golf courses, termite control, right-of-way, mosquito control, and lawn care. The agricultural use survey is conducted every three years and targets agricultural, nursery, and greenhouse use of general and restricted pesticides. This report focuses on the eleventh survey completed in this series (2015).

All statewide pesticide use surveys are performed under the authority of the New Jersey Pesticide Control Code, N.J.A.C. 7:30-1 et.seq., requiring applicators to maintain pesticide records for two years and to submit records of pesticide use to the state when requested. This regulative authority provides an accuracy and level of response that is difficult to duplicate in a voluntary, nationwide survey. In fact, these New Jersey surveys could be considered a pesticide usage census rather than a probabilistic survey.

The information collected from the OPEM pesticide use surveys is used by agencies within the NJ Department of Environmental Protection along with other state agencies to aid in research, exposure management and monitoring efforts in areas such as ground water protection, farm worker protection and education, and residual pesticide sampling. The survey data are also entered into state and federal geographical information systems for geographical distribution.

Survey Methods

The NJ Department of Environmental Protection, Bureau of Licensing & Registration's records were used to identify all 1648 private applicators licensed as of December 2015. "Private applicators" (persons using pesticides on agricultural commodities) include farmers, ranchers, sod farmers, Christmas tree growers, and nursery and greenhouse operators. A survey form was sent to each applicator, but since two or three applicators can work on the same agricultural establishment, the accompanying cover letter requested that only one form be returned for each agricultural establishment to avoid duplication of response. A total of three mailings were sent during the first four months of 2016.

The survey requested information on each pesticide product used during the calendar year. The information requested included trade name, EPA registration number, percent active ingredient, amount applied, number of acres treated, and type of crop treated.

Survey information received was then entered into a database file. This information file was then merged with a second database that linked chemical names with trade names, and a subprogram converted total amounts of formulated product to total amounts of active ingredient (lbs ai.).

Results

Overall, 80% (1322 of 1648) of the applicable licensed applicators responded to the survey. The list of non-respondents was turned over to the Bureau of Pesticide Compliance section for follow-up. Table 1 lists the chemicals and their amounts reported in the 2015 survey. Total New Jersey agricultural pesticide use for 2015 according to the survey was 1,111,050 pounds of active ingredient. Agricultural pesticide usage increased from 978,247 to 1,111,050 pounds of active ingredient from 2012 to 2015.

Table 2 lists the most frequently used compounds by pesticide category and overall. The single most used compound in 2015 was the fungicide azoxystrobin which made up 16% of the state's total agricultural pesticide use. Azoxystrobin, a fungicide used on crops including cucumbers, corn, tomatoes and peppers, increased from 5,039 (2012) to 181,315 (2015) pounds of active ingredient. Mancozeb, a fungicide used on crops including apples, corn, squash and tomatoes, increased from 37,860 (2012) to 59,758 (2015) pounds of active ingredient. There was a 10% increase in overall fungicide use between 2012 and 2015.

The second highest total use was glyphosate, with 12% of the state’s total. Glyphosate is a widely used herbicide for weed control, site preparation and spot treatment.

Table 3 lists the amounts and percentages of agricultural pesticide use on each crop type. Cranberries and field corn received the highest percentage of the total reported pesticide use.

Table 4 lists by county the amounts and percentages of the state's total pesticide use. The southern half of New Jersey makes up most of the state's agricultural production. Atlantic, Burlington, Cumberland, Gloucester and Salem counties, all located in the south, showed the highest pesticide use. Warren, the strongest agricultural county in the north, displayed a moderate use. The heavily industrialized northern counties such as Bergen, Essex, Hudson and Union showed an expected small usage.

Discussion

Discussion of the data collected in the 2015 agricultural pesticide use survey must focus on the uniqueness of New Jersey's agriculture. A primary point to consider is the absence of a particular major crop. Due to New Jersey's geographical location, climatic conditions allow the production of

a tremendous selection of vegetables and fruits, and the state incorporates a vast collection of what are termed "truck farms", where a variety of small crops are grown on the same farm. Therefore, although individual pesticides may dominate use on a particular crop, there is no group of pesticides that dominate use in the state. This is in contrast to many mid-western states, where corn herbicides represent the predominant use.

In reporting and evaluating pesticide use, it is important to consider the many, diverse influences on pesticide use. No single factor, or even set of factors, can completely account for fluctuations in the amounts of pesticide active ingredients used from survey to survey. Weather conditions such as temperature and rainfall, in terms of duration, timing and amounts or degrees, influence pest pressure and the associated response. In agricultural settings, issues such as cropping patterns and demand for a particular crop, and the associated pest impacts, vary from year to year.

Another factor is the adoption of Integrated Pest Management (IPM). IPM is an environmentally sensitive and cost-effective approach to pest control, utilizing insect life cycle monitoring and current pest control methods to minimize pest damage with the least possible risk to people, property and the environment. In the long term, IPM should result in overall pesticide use reduction. Short term, however, some emergency pest control situations to avoid total crop loss (Special Local Needs 24c and Emergency Exemptions Section 18 pesticide registrations) may require increased pesticide applications beyond the alternative means contained in an IPM program. Additionally, some reduced-risk pesticide alternatives may have higher application rates than the materials they replace.

Based on the results of the 2015 survey, future OPEM environmental monitoring projects should focus on fungicides. The OPEM Food Monitoring & Evaluation Program should target crops that tend to require the application of fungicides, specifically azoxystrobin and mancozeb. An increase in fungicide use could lead to spray drift or potential Tolerance violations. OPEM should also target areas where agricultural run-off could impact non-target water bodies to determine if the fungicide use increase is adversely affecting the environment.

TABLE 1. Pesticide amounts (lbs. active ingredient) reported in the New Jersey 2015 Agricultural Pesticide Use Survey.

*Indicates a pesticide that was not reported on the previous survey.

HERBICIDES:	
2,4-D	11276
2,4-DP	11
2,4-DT	5
Acetochlor	4302
Acifluorfen	207
Alachlor	627
Ametoctradin	304
Atrazine	40852
Benfluralin	19
Bensulide	15718
Bentazon	826
Bicyclopyrone*	66
Bromoxynil	23
Carfentrazone-ethyl	13
Chlorimuron-ethyl	1322
Chlorsulfuron	<1
Chlorthal-dimethyl	11080
Clethodim	3450
Clomazone	1442
Clopyralid	382
Cloransulam-methyl	143
Cycloate	1470
Dicamba	2060
Dichlobenil	358
Dimethenamid	558
Diquat	102
Dithiopyr	152
Diuron	4673
EPTC	59
Ethalfluralin	2273
Ethofumesate	111
Fenoxaprop-ethyl	26
Fluazifop-butyl	33
Flumetsulam	8
Flumiclorac-pentyl	31
Flumioxazin	3549
Fluroxpyr	15
Fluthiacet-methyl	95
Fomesafen sodium	846
Glufosinate-ammonium	2596
Glyphosate	137695
Halosulfuron-methyl	91
Hexazinone	112
Imazamox	3
Imazaquin*	9
Imazethapyr	69
Imazosulfuron*	36
Indaziflam	106
Isoxaben	753
Isoxaflutole	664
Lactofen	11
Linuron	4916
Mecoprop	710
Mesosulfuron-methyl	15
Mesotrione	2417
Metolachlor	19703
Metolachlor-S	31518
Metribuzin	2852
Metsulfuron-methyl	106
Napropamide	6625
Nicosulfuron	2
Norflurazon	6680
Oryzalin	11274
Oxadiazon	336
Oxyfluorfen	1641
Paraquat	15384
Pelargonic acid	16
Pendimethalin	12254
Phenmedipham	1048
Primisulfuron	8
Prodiamine	3779
Prometon	27
Prometryn	341

Pronamide	423
Pyroxasulfone*	627
Pyroxsulam	9
Quinclorac	27
Quizalofop-ethyl	422
Rimsulfuron	126
Saflufenacil	402
Sethoxydim	379
Siduron	660
Simazine	2856
Sulfentrazone	1027
Sulfometuron	<1
Tembotrione	96
Terbacil	1641
Thiencarbazone-methyl	66
Thifensulfuron	545
Topramezone	<1
Tribenuron	79
Triclopyr	51
Trifluralin	1364
TOTAL HERBICIDES:	**383087**

INSECTICIDES:

Abamectin	69
Acephate	3796
Acequinocyl	6
Acetamiprid	351
Azadirachtin (Neem)	16
Bifenazate	246
Bifenthrin	2174
Bacillus sp.	4746
Carbaryl	8124
Chlorantraniliprole*	631
Chlorfenapyr	6
Chlorpyrifos	8057
Clofentezine	29
Clothianidin	235
Cyantraniliprole	13
Cyflumetofen*	16
Cyfluthrin	1280
Cyhalothrin	1227
Cypermethrin	351
Deltamethrin	1
Diazinon	2632
Dichlorvos (DDVP)*	12
Dimethoate	548
Dinotefuran	177
Emamectin	<1
Endosulfan	90
Esfenvalerate	138
Etoxazole	19
Fenbutatin oxide	3
Fenpropathrin	302
Fenpyroximate	142
Fenvalerate*	56
Fipronil	67
Flonicamid	9
Flubendiamide	55
Flupyradifurone*	142
Fluvalinate	6
Hexythiazox	34
Imidacloprid	1958
Indoxacarb	582
Isaria fumosorosea*	16
Limonene	6
Malathion	7201
Methidation	<1
Methiocarb	103
Methomyl	8682
Methoxyfenozide	431
Mexacarbate	<1
Novaluron	103
Oil	80663
Oxamyl	1409
Permethrin	1073
Phorate	120
Phosmet	8045
Pymetrozine	1328
Pyrethrins	5
Pyridaben	123
Pyridalyl	14

Soap	356
Spinetoram	846
Spinosad	1166
Spirodiclofen	34
Spiromesifen	224
Spirotetramat	81
Sulfoxaflor*	15
Tefluthrin	4
Terbufos	233
Thiacloprid	8
Thiamethoxam	735
Trichlorfon	20
TOTAL INSECTICIDES:	**151393**

FUNGICIDES:

Acibenzolar-methyl	24
Ametoctradin*	304
Azoxystrobin	181315
Boscalid	945
Buprofezin	71
Captan	53814
Chlorothalonil	49938
Coniothyrium mintans	193
Copper salts	32929
Cyazofamid	734
Cyflufenamid*	38
Cymoxanil	596
Cyproconazole*	30
Cyprodinil	2492
Difenoconazole	464
Dimethomorph	247
Dodine	181
Etridiazole	599
Famoxadone	561
Fenamidone	40
Fenarimol	1
Fenbuconazole	1558
Fenhexamid	706
Ferbam	1317
Fluazinam*	61
Fludioxonil	319
Fluopicolide	588
Fluopyram	146
Fluoxastrobin	<1
Fluxapyroxad	325
Flutolanil	7
Flutriafol	10
Fosetyl-al	799
Gliocladium virens*	148
Iprodione	3183
Kresoxim-methyl	122
Laminaran	4
Mancozeb/Mnb/Znb	59758
Mandipropamid	377
Maneb*	94
Mefenoxam	533
Metalaxyl	1114
Metconazole	124
Metiram	439
Metrafenone	102
Myclobutanil	1205
Penthiopyrad	267
Phosphoric acid	214
Picoxystrobin*	73
Piperalin	1
Polyoxin D Zinc	57
Potassium Bicarbonate	196
Potassium Phosphite	21164
Propamocarb HCL	6128
Propiconazole	824
Prothioconazole	251
Pyraclostrobin	2985
Pyrimethanil	12
Quinoxyfen	2916
Quintozene	388
Reynoutria sachalinensis	90
Sulfur	59486
Tebuconazole	286
Thiabendazole*	14
Thiophanate-methyl	4981
Thiram	356
Triadimefon	125
Trichoderma harzianum	18

Trichoderma virens*	9
Trifloxystrobin	583
Triflumizole	76
Ziram	36309
Zoxamide	18
TOTAL FUNGICIDES:	**536383**

RODENTICIDES:

Brodifacoum	<1
Chlorophacinone	<1
Diphacinone	<1
TOTAL RODENTICIDES:	<3

GROWTH REGULATORS:

Aminoethoxyvinylglycine	9
Ancymidol	<1
Benzyladenine	24
Chlormequat chloride	148
Cyromazine	141
Cytokinin	<1
Daminozide	848
Diflubenzuron	7
Dikegulac sodium*	2
Ethephon	254
Fenoxycarb	<1
Flurprimidol*	1
Gibberellin	46
Indole-3-butyric acid	4
Kinoprene	40
NAA, NAD	5
Paclobutrazol	18
Prohexidione calcium	27
Pyriproxyfen	134
Trinexapac-ethyl	226
Uniconazole	1
TOTAL GRs:	**1938**

FUMIGANTS:

Metam-sodium	26180
Zinc Phosphide	14
TOTAL FUMIGANTS:	**26194**

BACTERICIDES:

Ammonium chloride	19
Caprylic acid*	1
Hydrogen Peroxide	8860
Nitrapyrin	7
Oxytetracycline	405
Peroxyacetic acid*	825
Streptomycin	629
TOTAL BACTERICIDES:	**10746**

MISCELLANEOUS:

Capsaicin	1
Garlic oil*	4
Iron phosphate	3
Kaolin	997
Metaldehyde	94
Methyl anthranilate	68
Neem oil	6
OBD	<1
Octadecadienol	1
Paecilomyces lilacinus*	11
Piperonyl butoxide	30
Sodium percarbonate	9
Soybean oil*	10
SPR/STK/Defoam*	74
TOTAL MISCELLANEOUS**:**	**1309**

TOTAL PESTICIDE USE: 1111050

Herbicides:	35 %
Insecticides:	14 %
Fungicides:	48 %
Fumigants:	2 %
Other:	1 %

TABLE 2. Highest use compounds in 2015 from the main pesticide categories. Shown are compounds >= 5% of class.

Compound	Lbs. Active Ingredient	% of Class	% of Total Use
HERBICIDES:			
Glyphosate	137695	36 %	12 %
Atrazine	40852	11 %	4 %
Metolachlor-S	31518	8 %	3 %
Metolachlor	19703	5 %	2 %
INSECTICIDES:			
Oil	80663	53 %	7 %
Methomyl	8682	5 %	<1 %
Carbaryl	8124	5 %	<1 %
Chlorpyrifos	8057	5 %	<1 %
Phosmet	8045	5 %	<1 %
FUNGICIDES:			
Azoxystrobin	181315	34 %	16 %
Mancozeb/Mnb/Znb	59758	11 %	5 %
Sulfur	59486	11 %	5 %
Captan	53814	10 %	5 %
Chlorothalonil	49938	9 %	4 %
Ziram	36309	7 %	3 %
Copper salts	32929	6 %	3 %
FUMIGANTS:			
Metam-Sodium	26180	99 %	2 %

TABLE 3. Total pesticide amounts (lbs. active ingredient) applied to crops in 2015.

CROP	AMOUNT	% of Total Pesticide Use
Apples	82917	7.4
Peaches	99900	9.0
Other Tree Fruit	8907	0.8
Blueberries	101500	9.1
Cranberries	221405	19.9
Strawberries	6940	0.6
Grapes	18350	1.6
Sweet Corn	13899	1.2
Field Corn	123690	11.1
Grains	10704	1.0
Soybeans	98036	8.8
Beans/Peas	4345	0.4
Asparagus	6878	0.6
Cucumbers	24456	2.2
Tomatoes	37107	3.3
Peppers	36047	3.2
Eggplants	5614	0.5
Potatoes	18605	1.7
Chinese Vegetables	5372	0.4
Cabbage	6073	0.5
Cauliflower	674	0.1
Broccoli	872	0.1
Brussel Sprouts	474	0.0
Other Cole	800	0.1
Lettuce	10277	1.0
Spinach	6212	1.0
Leafy Greens	11150	1.0
Other Leafy	27238	2.5
Hay/Alfalfa	6579	0.6
Sod	12322	1.1
Ornamentals	56497	5.0
Livestock	2628	0.2
no code^	44582	4.0

ALL CROPS	1111050	100.0

^No crop codes were indicated or commodity treated was not originally listed on survey. Frequently reported commodities not appearing on the list were pumpkins and root vegetables such as onions, carrots and radishes.

TABLE 4. Total pesticide amounts (lbs. active ingredient) applied by county in 2015.

COUNTY	Amount	Total Use
Atlantic	128514	12 %
Bergen	926	<1 %
Burlington	289416	26 %
Camden	6172	1 %
Cape May	11740	1 %
Cumberland	161567	15 %
Essex	0	0 %
Gloucester	124697	11 %
Hudson	0	0 %
Hunterdon	42776	4 %
Mercer	22682	2 %
Middlesex	9523	1 %
Monmouth	34188	3 %
Morris	18543	2 %
Ocean	13939	1 %
Passaic	2190	<1 %
Salem	162972	15 %
Somerset	5507	<1 %
Sussex	6325	<1 %
Union	4	<1 %
Warren	69369	6 %
TOTAL	1111050	100