NEW JERSEY FOOD MONITORING & EVALUATION PROGRAM 2010-2012

NJ Department of Environmental Protection
Pesticide Control Program

Introduction

The New Jersey Food Monitoring & Evaluation Program (NJFMEP) was initiated in 2000. The project was designed to identify pesticide residues on fresh produce being grown and sold in New Jersey. While the project was initially envisioned to examine New Jersey grown produce exclusively, the scope has expanded to include fresh produce that is being sold in New Jersey, regardless of where it is grown. These non-New Jersey grown items make up a large percentage of the fresh produce available to New Jersey consumers. This project examines fresh produce from roadside markets. While expanding into other sampling venues throughout the last decade, roadside markets continue to be the focus.

NJFMEP is intimately related to the 1996 Food Quality Protection Act (FQPA). Laboratory methods geared to detect the smallest possible residues present on various New Jersey grown crops will provide insight into actual pesticide residue levels as opposed to theoretical or calculated levels. The US Environmental Protection Agency (EPA) has determined allowable levels for pesticide residues on raw and processed agricultural commodities. These EPA Tolerance Levels are the only legal means to control the amount of pesticide residues on commodities consumed by the public.

The information gathered through NJFMEP is critical in maintaining the quality of the food supply while also assuring risk estimates (EPA Tolerance Levels) are not exceeded, and allows the New Jersey Department of Environmental Protection (NJDEP), Pesticide Control Program (PCP) to accurately determine pesticide exposure levels. Realistic assessments of proposed Tolerance revisions would also be achieved utilizing the data collected through NJFMEP.

Methods

Sample collection occurs for the duration of the growing season in New Jersey (approximately May through September) from locations throughout the State's 21 counties. Pesticide applications occur throughout the growing season while the crops are in the fields and after they are harvested. To capture both pre- and postharvest applications, samples are collected at the point of purchase when all applications have already occurred.

NJFMEP currently includes 22 commodities likely to be found at roadside markets. "Staple" commodities routinely found at roadside markets include apples, cucumbers, peppers, peaches, squash and tomatoes. Items such as Asian vegetables have also become popular as added value products. All of the 22 commodities may not be represented in the sample pool every season; commodities selected for sampling are based on national trends or current issues being faced by New Jersey's growers.

The samples are processed and analyzed by the NJDEP's PCP Laboratory. Composites representing samples are homogenized by blending and extracted for analysis in accordance with the PCP laboratory SOP entitled "Preparation of Pesticide Residue Extracts from Fruits and Vegetable Samples Using Dispersive Solid-Phase Extraction, QuEChERS." Unlike the national USDA Pesticide Data Program (PDP), samples are not washed or rinsed to remove any dirt or debris before they are extracted. The multi-residue extracts are analyzed by a gas chromatograph/mass spectrometer (GC/MS) and triple quad liquid chromatograph/mass spectrometer (LC/MS) for a large list of targeted pesticide compounds consisting of fungicides, herbicides, and insecticides from various chemical families. The current GC/MS and triple quad liquid chromatograph/mass spectrometer (LC/MS) scans consists of approximately 300 different pesticide residues. In addition to the targeted compounds, unknowns will be examined with the intention of identifying potential pesticides using mass spectral library searches and interpretation.

Results

A total of 147 fresh produce samples were collected and analyzed during the 2010 through 2012 sampling seasons (Table 1).

Because both pre- and postharvest applications are captured and the samples are not washed or peeled, these results represent the maximum exposure risk to pesticide residues from each individual sample. Of the 147 samples analyzed, 57% contained no pesticides, 16% contained one pesticide and 27% contained more than one pesticide. While the USDA PDP had a significantly larger sample pool (12,028 samples), their 2010 data similarly show 41% contained no detectable pesticides, 18.5% contained one pesticide and 40.5% contained more than one pesticide. Examination of multiple resides from the same commodity is significant because pesticides with common mechanisms of toxicity can lead to cumulative exposures.

Since the program began in 2000, only 1% of the samples collected have contained residues exceeding EPA Tolerance. Only 6% have had residues with no associated EPA Tolerance (Table 2). These results are comparable to the 2010 USDA PDP program results in which 0.25% contained residues exceeding EPA Tolerance and 4.3% contained residues with no associated EPA Tolerance.

With the introduction of new extraction and analytical techniques, we are able to detect a larger library of pesticides at significantly lower levels. While the number of residue detections has increased over the years, it should be noted that the number of non-compliant samples (Tolerance violations and misapplications) have actually decreased.

The most common source of non-compliant results is a misapplication (drift, etc.) that results in a residue on a commodity when the pesticide is not labeled for use on that commodity. While residue concentrations resulting from a misapplication are typically just above the analytical reporting level (and usually well below the Tolerance), these results are turned over to the Pesticide Control Program's Enforcement Element for further investigation. Although not nearly as common as a misapplication, Tolerance violations do occur. These samples are also turned over for further investigation.

The draw of fresh produce has made roadside markets increasingly popular in the past few years. Consumers are increasingly concerned about the origins of their food. During the 2010 through 2012 growing seasons, 78% of the samples collected were grown in New Jersey. The remaining 22% were not grown in New Jersey or had an unknown origin (Chart 1.) The national PDP statistics for 2010 indicate that 73.8% of the samples were grown in the United States. Imported fresh produce accounted for 23.8%. The remaining 2.4% were of mixed or unknown origin. Differing pesticide regulations, growing conditions and pest pressures make it likely that imported and domestic commodities will differ in their residue profiles.

"Buying local" has become a mainstream trend over the last few years. Demand for fresh, local produce and consumer awareness of pesticides makes residue monitoring at roadside markets critical in New Jersey. Pick-your-own operations can increase the risk of exposure when consumers are in the fields or orchards at the sites of applications. Future monitoring may focus on pick-your-own operations as the popularity of agritourism continues to grow.

NJFMEP began including organic produce in sample collections during the 2003 season. Only a small number (17) of organic samples have been collected. There had been no residue detections on organic produce until the 2012 season. One sample of blueberries being sold as organic had residues of three different pesticides. A provision in the National Organic Program (NOP) Final Rule (7 CFR Part 205.671) states that "when residue testing detects prohibited substances at levels that are greater than 5 percent of the EPA's tolerance for the specific residue detected or unavoidable residual environmental contamination, the agricultural product must not be sold, labeled, or represented as organically produced". All three pesticides were labeled for use on blueberries and the residues were well below 5% of the established Tolerance. However, public perception maintains that organic commodities should be residue-free. Future monitoring may also include more organic samples and a more in depth look at the NOP regulations.

More information regarding NJFMEP can be found under the Publications link on the Pesticide Control Program's website (www.pcpnj.org).

Table 1. Residues found on fresh produce samples from 2010-2012.

Commodity	Samples With Residues	Pesticide	Number of Times Detected	Residue Range (ppm)	EPA Tolerance (ppm)	5% of EPA Tolerance (ppm)
Apples (6 samples)	3					
		Captan	2	1.1-6.5	25	1.25
		Phosmet	2	0.23-0.71	10	0.5
Asparagus (13 samples)	3					
		Diflubenzuron	2	<0.008	**	
		Carbendazim	1	0.084	**	
		Imidacloprid	1	0.0098	**	
		Thiophanate-methyl	1	0.090	**	
Blueberries (16 samples)	14					
		Methomyl	4	<0.004-0.260	6.0	0.3
		Pyraclostrobin	3	<0.009	4.0	0.2
		Acetamiprid	4	<0.008	0.60	0.03
		Phosmet	6	<0.2-0.2	10	0.5
		Azoxystrobin	3	<0.2-1	10	0.5
		Bifenthrin	2	<0.2-0.27	1.8	0.09
		Carbendazim	1	<0.008	**	
		Carbaryl	3	<0.004-0.056	3.0	0.15
		Imidacloprid	5	<0.008-0.013	3.5	0.175
Broccoli (10 samples)	7					
		Imidacloprid	6	<0.008	3.5	0.175
		Indoxacarb	2	<0.004	12	0.6
		Thiamethoxam	1	<0.008	4.5	0.225
		Chlorothalonil	1	0.41	5.0	0.25
		Pyraclostrobin	2	<0.004-0.086	5.0	0.25
Cucumbers (15 samples)	9					
		Imidacloprid	1	<0.008	0.5	0.025
		Thiamethoxam	8	<0.008	0.2	0.01
		Methomyl	1	0.0096	0.2	0.01
Eggplant (12 samples)	2					
		Imidacloprid	1	<0.008	1.0	0.05
		Thiamethoxam	1	<0.008	0.25	0.0125
		Methomyl	1	0.0075	0.2	0.01
		Oxamyl	1	0.084	2.0	0.1
Lettuce (8 samples)	2					
		Imidacloprid	1	0.07	3.5	0.175
		Thiamethoxam	1	0.008	4.0	0.2
		Lambda-cyhalothrin	1	0.22	2.0	0.1
Peaches (12 samples)	12					
		Indoxacarb	4	<0.004-0.013	0.9	0.045
		Methomyl	7	<0.004-0.025	5.0	0.25
		Pyraclostrobin	6	<0.004-0.069	2.5	0.125
		Dinotefuran	3	<0.008-0.089	1.0	0.05
		Imidacloprid	3	<0.008-0.024	3.0	0.15
		Acetamiprid	2	0.015-0.021	1.2	0.06
		Fenpropathrin	2	0.025-0.270	1.4	0.07
		Thiophanate-methyl	1	0.056	3.0	0.15
		Lambda-cyhalothrin	1	0.34	0.5	0.025
		Phosmet	2	0.89-1.1	10.0	0.5
		2,4-D	1	<0.02	0.05	0.0025
		Carbaryl	1	0.120	10	0.5
Peppers (5 samples)	0	--	--	--	--	--
Potatoes (5 samples)	1					
		Chlorpropham	1	1.8	30	1.5

Table 1 (cont.). Residues found on fresh produce samples from 2010-2012.

Commodity	Samples With Residues	Pesticide	Number of Times Detected	Residue Range (ppm)	EPA Tolerance (ppm)	5% of EPA Tolerance (ppm)
Spinach (6 samples)	4					
		Captan	1	Identified*	0.05	0.025
		Imidacloprid	4	<0.008-0.1	3.5	0.175
		Clothianidin	1	<0.02	3.0	0.15
		Azoxystrobin	2	0.83-0.93	30	1.5
		Pyraclostrobin	1	<0.004	29	1.45
Squash (9 samples)	0	--	--	--	--	--
Strawberries (11 samples)	5	Imidacloprid	1	<0.008	0.50	0.025
		Thiamethoxam	1	<0.008	0.30	0.015
		Thiophanate-methyl	1	<0.02	7.0	0.35
		Captan	1	Identified*	20.0	1
		Bifenthrin	1	<0.2	3.0	0.15
		Carbaryl	2	<0.004-0.004	4.0	0.2
		Pyraclostrobin	2	0.088-0.140	1.2	0.06

*Analyte was identified using the mass spectral library but was not confirmed by the analysis of a reference standard.
** There is currently no tolerance for this chemical on this commodity.

Table 2. Summary of New Jersey sample results for 2000 through 2012.

Year	Total Samples Collected	Samples With No Residues	Samples With Residues Within EPA Tolerances	Samples With Residues Over EPA Tolerances	Samples With Residues With No EPA Tolerances
2000	24	15	9	0	0
2001	105	59	39	0	8
2002	66	30	24	2*	10
2003	61	36	22	1	3
2004	51	32	16	1	3
2005	42	23	12	1	2
2006	8	5	2	1	0
2007	15	7^	6	0	0
2008	15	8	6	0	1
2009**	--	--	--	--	--
2010	38	34	4	0	0
2011	52	23	29	0	0
2012	57	26	31	0	4
	534	298	200	6	31
		56%	37%	1%	6%

*FDA Action Level.
^Two samples from 2007 were considered qualified and rejected.
**No samples were collected during this season to accommodate extraction and analytical method development.

Chart 1. Commodity origins 2010-2012.