United States Department of Agriculture
Agricultural Marketing Service
Science & Technology

Pesticide Data Program

Annual Summary Calendar Year 1995

Contents

List of Figures and Tables

Figures

Page No.

Tables

Preface

In 1991, the United States Department of Agriculture (USDA) was charged with implementing a program to collect data on pesticide residues in food. USDA's Agricultural Marketing Service (AMS) was appointed to undertake the creation and implementation of such a program, currently known as the Pesticide Data Program (PDP). PDP has been in operation since May 1991 and has published its findings for calendar years 1991 through 1994. This is the summary for calendar year 1995.

PDP's data on pesticides in selected commodities strengthen the Government's ability to respond to food safety and marketing concerns, to protect public health, and to provide the Environmental Protection Agency (EPA) with data needed to assess the actual dietary risk posed by pesticides.

EPA registers pesticides under a statutory standard that requires balancing the benefits of a pesticide use against its potential risks to human health and the environment. In making risk estimates, EPA uses a stepwise approach to minimize resource expenditures. As an initial worst case assessment, EPA assumes that all acres of all crops are treated with all pesticides for which they have a registered use. EPA also assumes that residues in treated crops are present at the maximum allowable level. A theoretical assessment risk based on these worst case assumptions may significantly exceed the actual risk of pesticide residues in the food supply and jeopardize the registration of pesticides important to American agriculture. Further refinements to the risk assessment are done if needed. These stepwise refinements include the use of percent of crop treated; statistical analyses of field data; considerations of the effects of washing, cooking, processing, storage, and use of monitoring data, if available and reliable. This is where PDP data are pivotal. PDP's sampling procedures were designed to capture actual residues in the food supply as close as possible to the time of consumption, thereby significantly upgrading the statistical reliability and extent of information needed for risk assessment.

PDP continues to focus on the National Academy of Sciences' conclusions as shown in the 1993 report *Pesticides in the Diets of Infants and Children.* In this report, the Academy recommends that pesticide residue monitoring programs target foods highly consumed by children, and that analytical testing methods used be standardized, validated, and subject to strict quality control and quality assurance programs. PDP is now a critical component of the Food Quality Protection Act of 1996. Title III Sec. 301(c) of the Act states: *The Secretary of Agriculture shall ensure that the residue data collection activities conducted by the Department of Agriculture in cooperation with the Environmental Protection Agency and the Department of Health and Human Services, provide for the improved data collection of pesticide residues, including guidelines for the use of comparable analytical and standardized reporting methods, and increased sampling of foods most likely consumed by infants and children.* PDP, as a result of the provisions of this Act, will have a more significant role in providing the data needed to evaluate cumulative exposure to pesticide residues with a common toxicological effect, and create a statistically reliable database on endocrine disruptors at minute detection levels needed to assess dietary risk to compromised population groups.

The States participating in PDP deserve special recognition for their contributions to the program. Sample collectors' vigilance and dedication allow AMS to adjust sampling protocols to respond to changing trends in commodity distribution. Laboratory staff have formulated recommendations to increase productivity and improve methodologies. PDP also thanks Phillip Kott of USDA's National Agricultural Statistics Service (NASS); Edward Zager of EPA; John Jones of the Food and Drug Administration (FDA); and the staffs at USDA's Animal and Plant Health Inspection Service (APHIS); Grain Inspection, Packers and Stockyards Administration (GIPSA); and Agricultural Marketing Service laboratories for providing their support to the program. In addition, we acknowledge GIPSA's services for the collection and analysis of wheat samples for PDP.

We welcome any comments on the Summary's presentation. Please send your comments and suggestions to the Science and Technology Division address listed below.

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Executive Summary

The Pesticide Data Program (PDP) was implemented by the United States Department of Agriculture (USDA) in May 1991 to collect data on pesticide residues in foods. The data are used by the Environmental Protection Agency (EPA) for its dietary risk assessment process and pesticide registration process, the Food and Drug Administration (FDA) to refine sampling for enforcement of tolerances, Foreign Agricultural Service, USDA, to support export of U.S. commodities in a competitive global market, the Economic Research Service, USDA, to evaluate pesticide alternatives, and the public sector in addressing food safety issues. PDP has issued data summaries for calendar years 1991 through 1994. This summary contains PDP findings for calendar year 1995.

During 1995, pesticides monitored by PDP included insecticides, herbicides, fungicides, and growth regulators in fresh and processed fruits and vegetables, and wheat. Pesticides and commodities were chosen for inclusion in the program based on EPA's data needs and USDA's food consumption surveys.

PDP planning and policy are coordinated through an Executive Steering Committee consisting of representatives of USDA, EPA, and FDA. USDA representatives to the committee include: Agricultural Marketing Service (AMS), National Agricultural Statistics Service (NASS), Economic Research Service (ERS), and Agricultural Research Service (ARS). PDP's administrative, sampling, technical, and database activities are the responsibility of the Science and Technology Division of AMS.

PDP operations in 1995 were managed through cooperative agreements with nine States, which are responsible for sample collection and analysis. Eight participating States (California, Florida, Michigan, New York, North Carolina, Ohio, Texas, and Washington) collected and analyzed samples during 1995. Colorado's samples were shipped to other participating laboratories for analysis. Together, these nine States represent approximately 50 percent of the Nation's population.

PDP was designed to provide information on the concentrations of pesticides in order to improve the quality of data that EPA uses to determine the residue levels in foods and estimate exposure to consumers. Without actual residue data, initial risk assessments are based on the theoretical maximum amounts of pesticide use and may overstate dietary exposure. A theoretical risk based on worst case assumptions may exceed the actual risk of pesticide residues in the food supply and jeopardize the registration of pesticides important to American agriculture. Where needed, EPA conducts further refinements to the risk assessment by using additional information that includes residue monitoring data, if available and reliable. This is where PDP data are pivotal. PDP data, which are collected as close to the point of consumption as possible, follows statistically reliable sampling protocols, thereby upgrading their usefulness for risk assessment.

PDP samples are collected without regard for commodity origin or variety, as close to the point of consumption as possible. Samples reflect what is available to the consumer throughout the year. PDP's sampling protocol takes into account the different volumes of produce distributed annually by each sampling site, thus removing a potential source of bias for estimates of residues in PDP commodities. Wheat samples were collected nationally from GIPSA's "file" samples submitted for quality assurance evaluation, based on state and monthly production.

Samples collected during 1995 consisted of 12 commodities: apples, bananas, carrots, grapes, green beans, oranges, peaches, potatoes, spinach, sweet corn, sweet peas, and wheat. Sweet corn and peas were collected as frozen and canned processed products. All other PDP samples were fresh. Samples collected originated from 39 States and 17 foreign countries. Of the 6,924 fruit and vegetable samples collected and analyzed: 1,143 (16.5 percent) were imported, with bananas, grapes, and peaches accounting for most imports. In addition, 600 wheat samples were collected and analyzed. Thirty-seven samples were received unsuitable for analyses and were discarded.

Of the 6,924 fruit and vegetable samples analyzed by the participating laboratories, approximately 65 percent contained at least one pesticide residue. Also, 79 percent of the 600 wheat samples had at least one pesticide residue. About 29 percent of the residue detections were due to post-harvest uses.

In 1995, there were 316 presumptive violations in 263 samples. Nine presumptive violations were for pesticide residues where the EPA tolerance was exceeded and 307 were presumptive violations where there was no established tolerance for the pesticide/commodity pair.

Most pesticide residue detections were below tolerance levels established by EPA. In PDP, the limits of detection for each pesticide/ commodity pair in the testing system are analytically defined at levels low enough to conduct realistic dietary risk assessments. This enables scientists using PDP data to consider not only residue detection findings but also the inverse, non-detected residues, in calculating dietary risk. Hence, risk assessment evaluations by EPA in the reregistration process can be based on the range of levels detected, including non-detected residues for each of the pesticide/commodity pairs tested.

PDP continuously strives to improve methodologies for the collection, testing, and reporting of data. PDP data are available to EPA and other Federal and State agencies charged with regulating and setting policies on the use of pesticides.

Pesticide Data Program (PDP)
Annual Summary, Calendar Year 1995

This summary consists of the following sections: (I.) Introduction, (II.) Sampling Protocol, (III.) Laboratory Operations, and (IV.) Sample Results and Discussion.

I. Introduction

To implement the Pesticide Data Program (PDP), the United States Department of Agriculture (USDA) utilized the expertise available in four of its agencies: the Agricultural Marketing Service (AMS), the National Agricultural Statistics Service (NASS), the Economic Research Service (ERS), and the Agricultural Research Service (ARS). AMS was selected as the lead agency to coordinate and implement the various facets of the residue program and manage program operations. NASS provides statistically reliable data on chemical usage at the State level and collects economic input data that link chemical usage with economic characteristics. ERS analyzes AMS and NASS data to understand producer behavior and to determine the impact various production practices and policies might have on the Nation's agricultural production, food supply, and consumers. ARS conducts nationwide surveys of individual food intake and household use and is developing a Food Grouping System to translate data on foods as consumed into forms that can be linked with pesticide residue data. AMS selected its Science and Technology Division to oversee PDP's policy planning and program direction with the participating State and Federal facilities.

Figure 1, Overview of PDP Management and Operations, describes the program's three major components - sample collection, laboratory analysis, and database management. In 1995, PDP sampling and/or analytical operations were performed by nine States (California, Colorado, Florida, Michigan, New York, North Carolina, Ohio, Texas, and Washington) through agreements with their respective State agencies. Accordingly, a significant part of PDP's financial resources (75 percent) went directly to the States for operating expenses. Ten percent of PDP funding was given to USDA laboratory facilities to support State testing activities for analyses requiring selective residue methods. An additional 2 percent was provided to GIPSA to conduct the wheat sampling and residue testing program.

Figure 2 shows the States participating in the program for collection of fresh and processed fruit and vegetable samples , which together represent about 50 percent of the Nation's population. Also shown are nine other States (Alaska, Connecticut, Hawaii, Massachusetts, Nevada, New Jersey, New Mexico, Vermont, and Wyoming) where a significant amount of produce is directly marketed from the participating States. Figure 3 shows the distribution of commodities by origin, domestic versus imported. Figure 4 is a map showing the distribution by State of wheat samples collected in 1995.

AMS works closely with EPA to select the commodities and pesticides to be placed in PDP. Commodities chosen for inclusion are those most often consumed by the American public, with emphasis on those consumed by infants and children. Twelve commodities (apples, bananas, carrots, grapes, green beans, oranges, peaches, potatoes, spinach, canned and frozen sweet corn and sweet peas, and wheat) were sampled and analyzed in 1995. The pesticides EPA suggests for monitoring consist mainly of those whose toxicities and estimated dietary exposures indicate the need for more refined exposure estimates. The list is revised periodically

Figure 1. Overview of PDP Management and Operations

Main Objectives

- Provide the Environmental Protection Agency (EPA) with high-quality data on residues in food. The data are used for dietary risk assessments and to address pesticide reregistration and special reviews.
- Address the recommendations of the National Academy of Science report *Pesticides in the Diets of Infants and Children*.
- Support Foreign Agricultural Service's international marketing of U.S. commodities.
- Address USDA's Food Quality Protection Act responsibility.

Executive Steering Committee

- USDA
  - -AMS
  - -NASS
  - -ERS
  - -ARS
- EPA
- FDA

Management and Operations

- Science and Technology Division

Sample Collection

- Statistically reliable sampling plan
- Data used to make national estimates
- Collected near consumer level
- Represent about 50% of U.S. population
- Commodities consumed mostly by infants and children
- Origin of product retained
- Post-harvest fungicides & minor use registration
- Standard Operating Procedures

Laboratory Analysis

- Samples prepared as if for consumption
- State-of-the-art instrumentation used
- Detection at very low levels
- QA based on EPA Good Laboratory Practices
- Confirmation of detected pesticides
- Multiple residue detection methodology
- Standard Operating Procedures

Database Management

- Customized query capability
- Electronic transmission or data
- Standardized data summaries

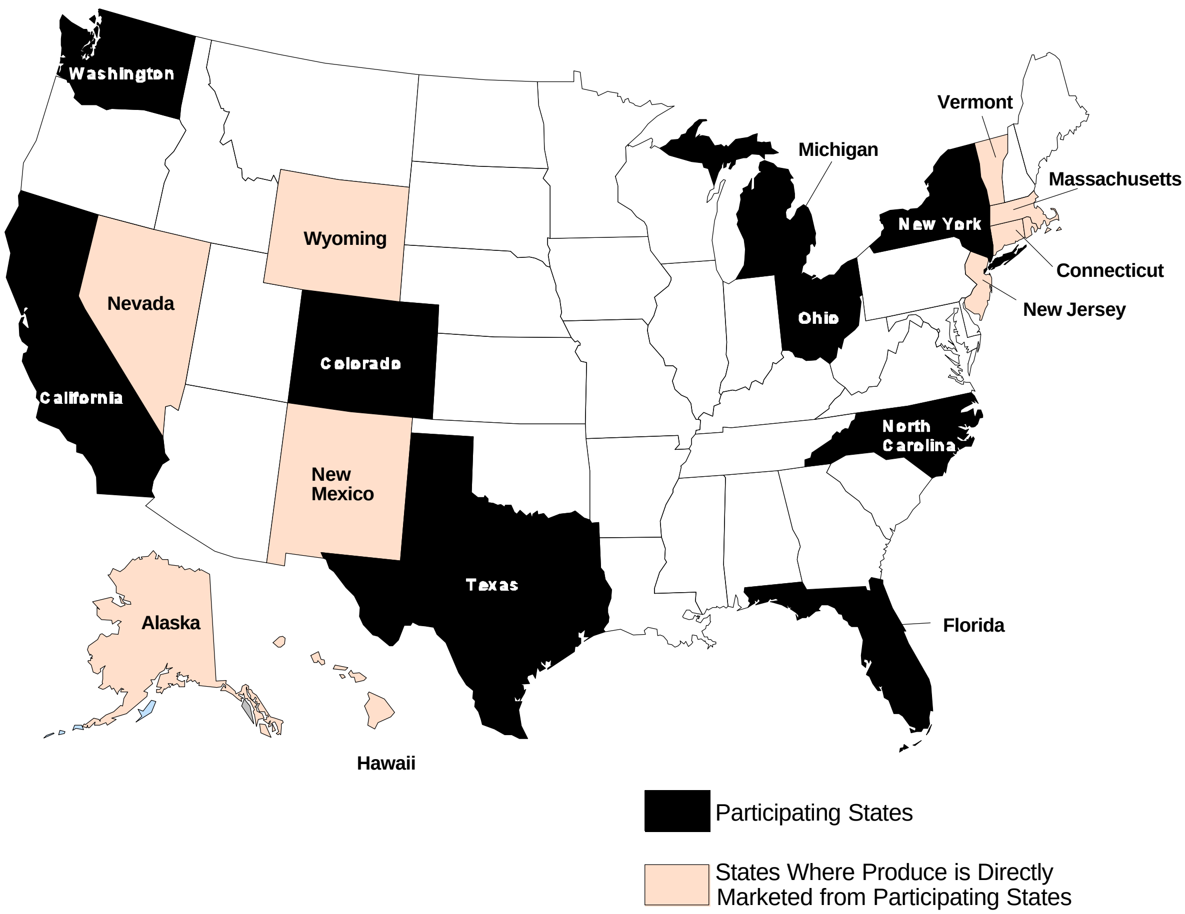
Participating States - 1995

- California
- Colorado
- Florida
- Michigan
- New York
- North Carolina
- Ohio
- Texas
- Washington

USDA Laboratories - 1995

- AMS Eastern Laboratory, Gastonia, NC
- APHIS, NMRAL, Gulfport, MS
- GIPSA, Kansas City, MO

Figure 2. Participating States and Their Geographical Distribution Areas



to address EPA's data needs. Table I is a list of pesticides included in the 1995 PDP testing profile for fruit and vegetables, and wheat.

Although EPA continues to be a primary recipient of PDP data, over the past year PDP has received requests for data from the Foreign Agricultural Service (FAS) and other government and industry sources to promote exporting American agricultural products in international markets. PDP data have also been solicited by chemical companies surveying use and residues of their products. PDP is now a critical component of the Food Quality Protection Act of 1996, which directs the Secretary of Agriculture to collect pesticide residue data on commodities highly consumed by infants and children in a uniform manner.

Currently, PDP collects data for over 400 pesticide and commodity combinations whose uses are legal under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). Data are also collected for other pesticide and commodity combinations with pending use registrations, or where uses have been granted under other provisions of FIFRA. In many of these cases, these uses are granted to alleviate the lack of effective pesticides registered for minor use crops (fruits and vegetables). Consequently, PDP data are also used for reregistration of pesticides for minor use crops.

PDP has also provided information to the Codex Alimentarius Commission and the World Health Organization, both of which operate under the auspices

Table 1. Pesticides in Pesticide Data Program 1995

PART IA. Fresh and Processed Fruits and Vegetables (F&V) (Quality Assurance Program)

Analyzed by Multiresidue Methods (MRMs)

48 Pesticides & 17 Metabolites / Degradates / Isomers

Acephate
Aldicarb + sulfone & sulfoxide
Atrazine
Azinphos methyl
Captan
Carbaryl
Carbofuran + 3-OH Carbofuran
Chlorothalonil
Chlorpropham
Chlorpyrifos
Dacthal (DCPA)
DDT + DDD + DDE
Diazinon
Dichlorvos (DDVP)
Dicloran
Dicofol
Dimethoate
Diphenylamine
Disulfoton + sulfone + sulfoxide
Endosulfan I, II & sulfate
Esfenvalerate/Fenvalerate
Ethion
Fenamiphos + sulfone + sulfoxide
Imazalil
Iprodione
Lindane
Malathion
Methamidophos
Methidathion
Methomyl
Methoxychlor
Mevinphos
Myclobutanyl
Omethoate
Oxamyl
Parathion
Parathion methyl
Permethrin cis & trans
Phorate + sulfone & sulfoxide
Phosphamidon
Propargite
Quintozene (PCNB)
  Hexachlorobenzene (HCB)
  Pentachloroaniline (PCA)
  Pentachlorobenzene (PCB)
Terbufos + sulfone & O-analog
Thiabendazole
Thiodicarb (as methomyl metabolite)
Trifluralin
Vinclozolin

Analyzed by Selective Residue Methods (SRMs)

5 Pesticides + 3 Isomers

2,4-D
Abamectin (Avermectin b1a and delta 8,9 isomer)
Benomyl (as Carbendazim)
Fenbutatin Oxide (Hexakis) + metabolites
Formetanate

PART IB. Other Pesticides/Metabolites Analyzed in F&V

20 Pesticides + 5 Metabolites / Isomers

Allethrin
Anilazine
Azinphos ethyl
Benfluralin
Cyhalothrin lambda & isomer
Cypermethrin
Demeton-S
  Demeton + sulfone
Dieldrin
Diuron
Ethoprop
  4-OH Diphenylamine Metabolite
Linuron
MCPA (m-chlorophenoxyacetic acid)
Metalaxyl
Methiocarb + sulfoxide
  1-Napthol (Carbaryl Metabolite)
Ovex
Phosalone
Phosmet
Piperonyl Butoxide
Tecnazine
Toxaphene

PART II. Wheat

Analyzed by Multiresidue Methods (MRMs) - Quality Assurance Program

23 Pesticides + 5 Metabolites/Isomers

Atrazine
Azinphos Methyl
Carbaryl
Carbofuran + 3 -OH Carbofuran
Chlorpyrifios
Chlorpyrifos methyl
Demeton S
Diazinon
Dichlorvos (DDVP)
Diclofop methyl
Dimethoate
Disulfoton & sulfone
Endosulfan I, II & sulfate
Imazalil
Linuron
Malathion
Methomyl
Methoxychlor
Parathion
Parathion methyl
Phorate & sulfone
Triallate
Trifluralin

of the United Nations. The information provided was on extraneous residues in foods (environmental contaminants), such as DDT and metabolites, pesticide residue stability data, and PDP's Proficiency Check Sample Program.

To obtain pesticide residue data on fruit and vegetable commodities as close to the point of consumption as possible, samples are collected at distribution points just before release to supermarkets and grocery stores. Sampling at these locations allows for residue measurements that include fungicides and growth regulators, and takes into account degradation of pesticides while in storage. Participation of PDP sampling sites is voluntary, which sets it apart from State and Federal enforcement programs. There are over 650 potential sites granting access and providing information to sample collectors. Their cooperation makes it possible to adjust sampling protocols in response to fluctuations in food distribution.

PDP differs markedly from regulatory monitoring programs (tolerance enforcement) which require quick turnaround time for analysis of enforcement samples. Under tolerance enforcement, the sampled commodity may be detained at the distribution facility while awaiting sample results. PDP places emphasis on searching for residues at the lowest detectable levels, rather than on quick sample turnaround; therefore, analysis of PDP samples may take over a month, and does not affect commodity distribution.

As of the publication date of this Summary, PDP has considered 26 commodities in the testing program. Appendix H is a chronological history of the commodities in PDP from program inception to January 1997.

II. Sampling Protocol

Fruit and Vegetables Sampling Plan

PDP's statistically reliable sampling protocol for fresh and processed fruit and vegetables allows for making nearly unbiased estimates of pesticide residues for commodities collected in the participating States and makes it possible to quantify the accuracy of the estimates for the Nation as a whole. The protocol also reflects the relative proportion of imported versus domestic produce available to the consumer. This has been corroborated by comparing the composition of PDP samples with import data compiled by the Economic Analysis Branch, AMS Fruit and Vegetable Division.

Sampling Procedures

Participating States are responsible for compiling and maintaining lists of sites used for sample collection. Since PDP strives to collect samples as close to the consumer as possible, while maintaining sample origin, most of the sites for fresh fruits and vegetables are either terminal markets or large chain store distribution centers. Both of these locations serve as the last stopover before produce reaches retailers and, ultimately, consumers. This provides a better picture of actual dietary exposure to pesticide residues by taking into account pesticide degradation that occurs during transit and storage. Sampling at these locations also provides information on post-harvest application of fungicides and growth regulators.

Processed commodity samples are collected at distribution centers or large warehouses. To provide PDP with data on both canned and frozen sweet corn and peas, collection of the two types of processed commodity were alternated monthly.

After establishing their site lists, States are required to provide AMS and NASS with annual volume information for each site (quantity of commodity distributed in one year). This information is used to "weight" the site to determine the probability for selection. For example, a site that distributes 100,000 pounds of produce annually might be given a weight of "10," and a site that distributes 10,000 pounds might be weighted "1." The probability proportionate to size method of site selection would then result in the larger site (distributing 100,000 pounds) being 10 times more likely to be selected for sampling than the smaller site (distributing 10,000 pounds). Participating States are required to work with NASS to develop their statistical procedures for site weighting and selection. States are also given the option of having NASS perform their quarterly site selection for them. The number of sampling sites and the volume of produce distributed by the sites varies greatly from State to State.

State population figures are used to assign the number of fruit and vegetable samples scheduled for collection per commodity each month. For 1995, these numbers were: California-14, Colorado-2, Florida-7, Michigan-6, New York-9, North Carolina-4, Ohio-6, Texas-8, and Washington-4; for an annual total of 720 per commodity. Sample size was approximately 5 pounds for each applicable testing facility.

Sampling plans, which were prepared by the States on a quarterly basis, included sampling dates, sites, and fruit and vegetable commodities for collection during each month of the quarter. Although sites could only be sampled once per month for the same commodity, States were allowed to collect two different commodities at the same site on the same date. This "pairing" of commodities reduced the number of sampling dates; and, therefore, the cost of sample collection. States were also instructed to collect all samples of the same commodity on one sampling date, or, if needed, within two consecutive dates. Collection of commodities was randomly assigned to various weeks of the month, prior to selecting specific sampling dates within the week. Since sampling sites were selected for the entire quarter, States were allowed to assign the sites to particular months based on geographic location.

In 1995, seven of the participating States formed transshipment pools, whereby commodities collected by the paired States were combined into one set for analytical testing in one State laboratory. This arrangement created larger sample sets, increased proficiency and productivity, and substantially reduced the mandatory quality assurance costs. These paired

States are: Colorado, Michigan, and Washington; Florida and Texas; and North Carolina and Ohio.

Chain-of-custody for PDP samples is documented through the use of "Sample Information Forms." These forms are used by the sample collectors to record all pertinent sample information, such as: (1) the State where the sample was collected; (2) the date of collection; (3) the 3-digit code for the sampling site; and (4) the commodity code. These four pieces of information are combined to form a unique "sample identification number" for recording in the PDP database. Other information included on the form is: (1) whether the sample is domestic or imported and, if imported, the country of origin; (2) the name of the sampling site, grower, packer, or distributor; and (3) a list of potential or known post-harvest applications. The Sample Information Forms are also used to keep track of any missing samples that are not collected, lost in transit, or damaged and unable to be analyzed when received at the laboratory. Sampling managers in the participating States have been given Statement of Procedures (SOPs) for PDP sampling, which cover sample administration; collection, packing, and shipping procedures; and documentation. These SOPs, which are updated as needed, are provided to sample collectors, and used as a guide for determining compliance during sampling reviews.

Synopsis of Sample Collection (Fruit and Vegetables)

A total of 6,924 samples of fresh and processed fruits and vegetables were collected and analyzed during 1995. As shown in Table 2, the number of samples collected per State was: California - 1,607, Colorado - 228, Florida - 772, Michigan - 721, New York - 1,034, North Carolina - 477, Ohio - 696, Texas - 933, and Washington - 456. These figures are less than the total number of assigned samples for 1995 due to the unavailability of product at either the original or alternate sampling site, which is often due to the commodity growing season.

Table 2. Samples Collected & Analyzed per Commodity by Each Participating State

	Commodity											
State	AP	BN	CR	CS	GB	GR	OG	PC	PO	PS	SP	Total
California	156	121	163	139	146	160	163	91	169	140	159	1607
Colorado	23	17	24	23	17	24	22	12	22	23	21	228
Florida	78	49	80	77	64	76	76	41	81	80	70	772
Michigan	72	49	71	71	62	72	72	45	70	70	67	721
New York	106	74	104	104	82	105	106	60	105	104	84	1034
North Carolina	48	35	48	47	46	46	48	25	47	46	41	477
Ohio	71	46	71	71	56	68	72	36	72	70	63	696
Texas	94	63	96	93	80	95	93	48	95	92	84	933
Washington	47	32	46	46	34	48	48	19	46	45	45	456
Total	695	486	703	671	587	694	700	377	707	670	634	6924

Commodities		
AP - Apples	GB - Green Beans	PO - Potatoes
BN - Bananas (Jan-Sep)	GR - Grapes	PS - Sweet Peas
CR - Carrots	OG - Oranges	SP - Spinach
CS - Sweet Corn	PC - Peaches	

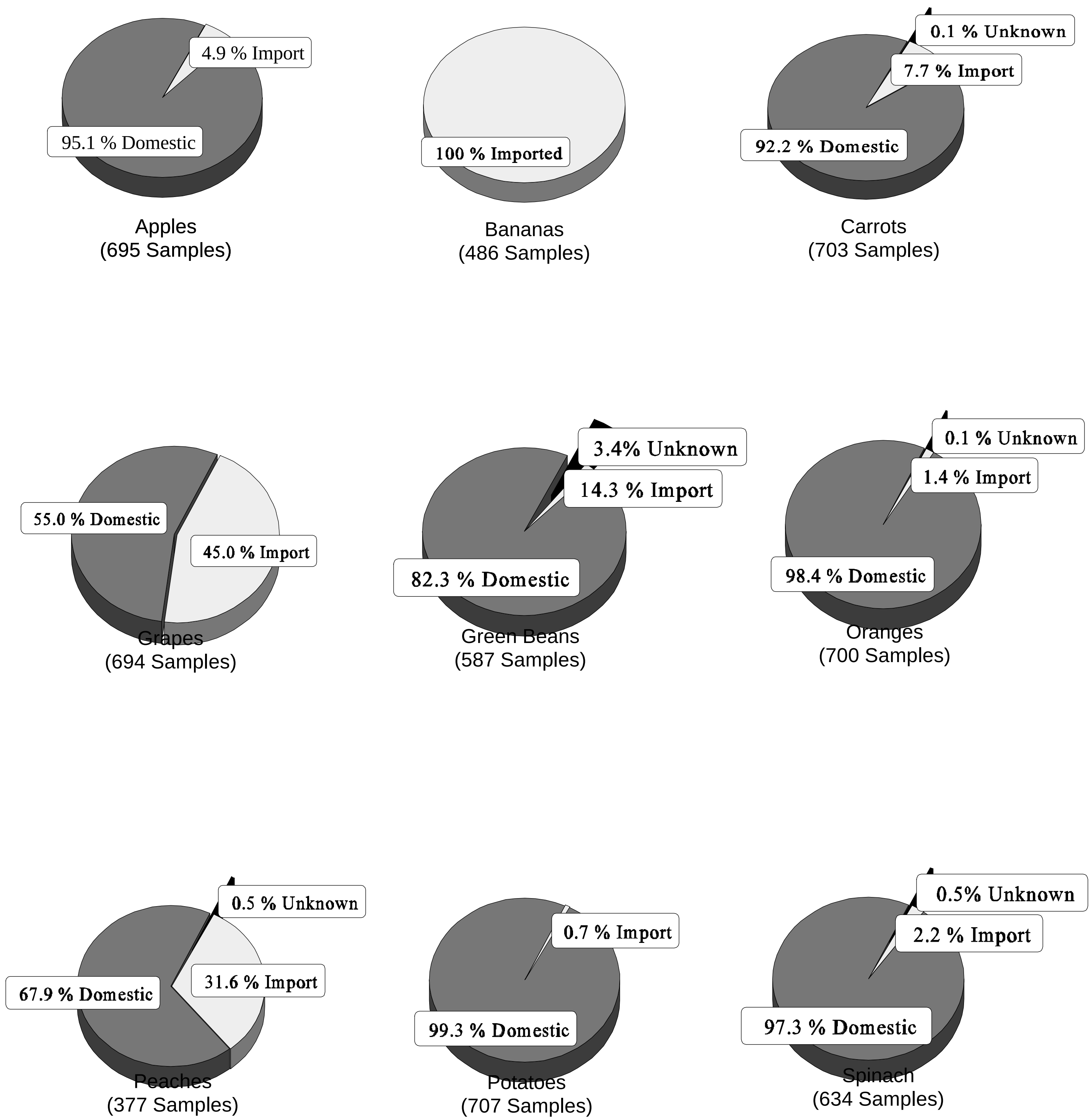
Figure 3 shows the total number of samples per commodity and the percentage of each that were either domestic, imported, or of unknown origin. Appendix A provides a more detailed breakdown of sample origin by State or country. As indicated, samples collected during 1995 originated from 39 States and 17 foreign countries.

Figure 3. COMMODITY ORIGIN (Percentage Domestic vs. Imported)

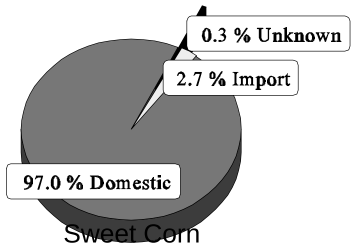
A. <u>Fresh Commodities</u>

Figure 3. COMMODITY ORIGIN (Percentage Domestic vs. Imported)

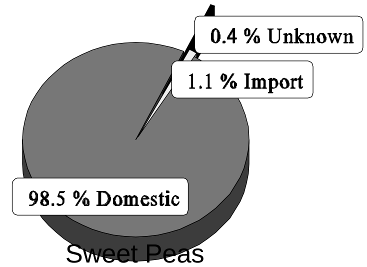
A. Fresh Commodities



B. Processed Commodities*



Sweet Corn
(671 Samples)



Sweet Peas
(670 Samples)

* For processed commodities, percentages were mainly derived from packer and/or distributor information.

Wheat Sampling Program

The Grain Inspection, Packers and Stockyards Administration (GIPSA) collected 600 wheat samples in calendar year 1995. Samples were collected from available "file" samples received from grain elevators and other storage facilities, but excluded wheat already segregated for export. Sample selection was done randomly based on predetermined algorithm of one in sixteen samples in GIPSA's 13 regional offices. Numbers of samples collected were based on product availability on a national basis by State and month, encompassing all seven varieties of wheat. Figure 4 is a map of the U.S. showing the distribution of the 600 wheat samples by State.

Figure 4. Distribution of Wheat Samples

A minimum of 500 to 1,000 grams of individuals representative samples of wheat were forwarded for pesticide analysis to GIPSA's Technical Services Division laboratory in Kansas City, MO. Chain-of-custody procedures were the same as for fruit and vegetable samples. The Sample Information Form included the location of the field office, inspection point, wheat variety, and date of inspection.

III. <u>Laboratory Operations</u>

Twelve laboratories (nine State and three Federal) performed analyses for PDP during 1995. These laboratories are equipped with advanced technical instrumentation capable of detecting residues at very low levels. The laboratory staff receives intensive training and must demonstrate analytical proficiency on an ongoing basis. Scientists continuously test new technologies and develop new techniques to improve the levels of detection. Major changes in methodology are evaluated, and their soundness demonstrated and documented in accordance with PDP Standard Operating Procedures (SOPs).

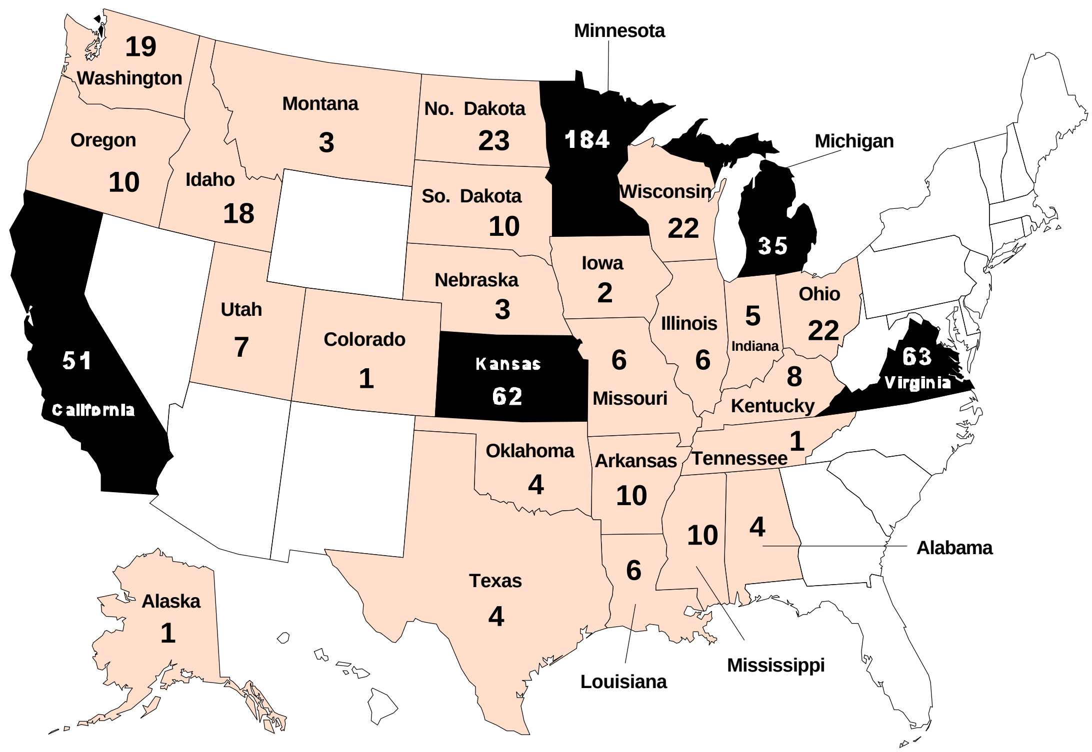
PDP participating laboratories monitored 48 pesticides plus 17 metabolites, degradates, and isomers using multiresidue methods (MRMs) and 5 pesticides plus 3 metabolites by single or selective residue methods (SRMs). Since SRMs are resource intensive, this type of analysis was performed only at selected laboratories for specific commodities as indicated below:

<u>Laboratories Performing SRMs</u>

1. <u>APHIS, NMRAL, Gulfport, MS</u>

Pesticide:	Benomyl
Commodities:	Carrots, Grapes, Green Beans, Oranges (Jan.-Sep.), Peaches, Sweet Corn, and Spinach.

Figure 4. Distribution of Wheat Samples



States with more than 30 Samples

States with less than 30 Samples

2. AMS Eastern Laboratory, Gastonia, NC

Pesticide:	Abamectin
Commodities:	Oranges

Pesticide:	Formetanate
Commodities:	Apples (Jan.-July), Oranges, and Peaches (Jan.-July)

3. APHIS, NMRAL, Gulfport, MS, and Selected State Laboratories

Pesticide:	2,4-D (Jan.-June)
Commodities:	Peaches, Sweet Peas, and Sweet Corn

4. APHIS, NMRAL, Gulfport MS, and the Washington State Laboratory, Yakima, WA

Pesticide:	Fenbutatin Oxide (Hexakis) and metabolites (July-Dec.)
Commodities:	Apples, Grapes, Oranges, and Peaches

Quality Assurance Program

The main objectives of the quality assurance/quality control (QA/QC) program are to ensure the reliability of PDP data and the performance equivalency of the participating laboratories. Direction for PDP's QA Program is provided through SOPs based on EPA's Good Laboratory Practices (GLPs). For day-to-day quality assurance oversight, PDP relies on the Quality Assurance Unit (QAU) at each participating facility. As required under EPA's GLPs, the QAU operates independently from their laboratory staff. Preliminary QA/QC review procedures are performed on-site by each laboratory's QAU. Final review procedures are performed by PDP staff, who are responsible for collating and reviewing data for conformance with SOPs. Additionally, PDP staff also monitors the participants' performance through proficiency samples, QAU quarterly internal reviews, and on-site visits. Additional information on PDP's QA Program is provided in Appendix B.

Sample Preparation

Laboratories are permitted to refrigerate fresh incoming samples of the same commodity for up to 72 hours, to allow for different sample arrival times from the collection sites. Frozen and canned commodities can be held in storage (freezer or shelf) until the entire sample set is ready to be homogenized.

Upon arrival at the testing facility, samples are visually examined for acceptability and discarded if determined to be inedible (decayed, extensively bruised). Accepted samples are then prepared emulating the practices of the average consumer, to more closely represent actual exposure to residues. Fresh samples are prepared as follows: (1) apples and peaches are washed and cored; (2) bananas and oranges are peeled; (3) carrots and potatoes are washed; (4) spinach is washed with inedibles removed; (5) green beans and grapes are washed and stems removed; and (6) wheat is ground and then analyzed. For processed commodities, the entire contents of the sample is homogenized--including any liquid present.

Samples are homogenized using choppers and/or blenders and separated into analytical portions (aliquots) for analysis. If testing cannot be performed immediately, the entire analytical set (sample set plus all quality control samples) is frozen at -40° C, or lower, according to PDP's QA/QC requirements. Surplus aliquots, not used for the initial testing, are retained frozen in the event that replication of analysis or verification testing is needed.

Sample Analysis

For analysis of fruit and vegetables, variations of the Luke I and II extraction procedures developed by FDA were used by Florida, Michigan, New York, North Carolina, Ohio, and Texas. California and Washington used the multiresidue method developed by the California Department of Food and Agriculture. These two methods were determined to produce equivalent data for PDP analytical purposes. Residues are extracted from samples using organic solvents followed by various cleanup procedures. Selective residue methods, used for 2,4-D, abamectin, benomyl, fenbutatin oxide (hexakis), and formetanate, were independently validated by the laboratory(ies) performing analysis.

Various types of chromatography are used for the initial identification and quantitation of pesticides. Confirmation is accomplished by mass spectrometry or by alternate detection systems, depending on the concentration reported. Limits of detection for various selective detectors are lower than those achieved by mass spectrometry detectors. Confirmation is deemed necessary due to the complexity of commodity matrices and the low concentration levels of detected residues. The confirmatory analysis provides an extra measure of confidence in the identification of both the pesticide residue and its concentration.

Analysis of wheat samples were performed by the GIPSA laboratory for 23 pesticides and 5 metabolites/isomers in PDP. Extraction was accomplished using supercritical fluid extraction (a solventless system) coupled with mass spectrometry detection or post-column high performance liquid chromatography detection.

IV. Sample Results and Discussion

Sample Results

During 1995, most pesticide residue detections were below tolerance levels established by EPA. A tolerance is the maximum allowable quantity of a pesticide residue for a particular commodity. In PDP, the limits of detection for each pesticide/commodity pair in the testing system is analytically defined at levels low enough to conduct realistic dietary risk assessments. This enables scientists using PDP data to consider not only residue detection findings, but also the inverse, non-detected residues, in calculating dietary risk. Hence, risk assessment evaluations by EPA in the reregistration process can be based on the range of levels detected, including non-detected residues for each of the pesticide/commodity pairs tested. This is illustrated in Appendixes C, D, E, and G.

Appendix C shows the distribution of detected residues per pesticide per commodity. Also shown are the minimum and maximum concentrations detected, tolerances, and samples for which there is no tolerance established or for which the concentration detected exceeds the tolerance. Non-detected residues for each of the pesticide/commodity pairs tested are shown in Appendix E.

National Estimates

One objective of PDP is to use the data collected by the nine participating States, which represent approximately 50 percent of the Nation's population (Figure 2), to project national estimates of pesticide residues for Program commodities. Some of these national estimates are shown in Appendix D. Although the availability of certain commodities may vary, depending on the season, PDP sampling procedures require that the same number of samples be collected each month. As a result, the relative sample composition for these seasonal commodities may not exactly match product availability throughout the year. Availability of peaches is the most pronounced example of this (limited availability in April and November, including both domestically grown and imported peaches). According to independent USDA data (*Fresh Fruit and Vegetable Arrival Totals for 22 Cities-FVAS-3 Calendar Year 1995,* published in 1996 by Fruit and Vegetable Division, AMS, Washington, DC) approximately 88 percent of all peaches available for consumption in 1995 arrived at wholesalers during the May-September time period. However, during this 5-month time period, PDP collected only 65 percent of the yearly total, or 23 percent less than what USDA's figures indicate was nationally available. This percentage is still substantially higher than the 42 percent scheduled for collection if peaches were readily available throughout the year. Consequently, the fact that peaches are not available consistently from month-to-month actually provides an automatic adjustment to the monthly sample numbers, causing them to more closely represent national availability. To further adjust for the remaining difference in actual sample numbers versus availability, the sampling data have been weighted to reflect U.S. wholesale arrivals. For more information on the weighting process used to determine national estimates, and on the statistical attributes of those estimates, refer to Kott, P.S., 1996, *Estimating Pesticide Residues in Selected Fruits and Vegetables for the 1994 Pesticide Data Program;* National Agricultural Statistics Service; Washington, DC. (The methods used in the 1994 and 1995 programs were identical.)

Appendix D focuses on the 52 pesticide/commodity pairs with detectable residues in at least 10 percent of the samples tested. A range of values for the estimated national mean (or average) level of residue concentration for each pair is provided. The lower value for the range was determined by treating a sample without detectable residues as if it had a residue concentration equal to zero. The upper value for the range was determined by treating such a sample as if it had a residue concentration equal to the limit of detection. In addition, Appendix D also provides national estimates for the 50th, 75th, and 90th percentiles for each of the pairs. The ratio of the 90th percentile to the tolerance, as a normalization factor, is also shown. This demonstrates that, in most cases, the levels of detected residues are a small fraction of the tolerances for the listed pesticide/commodity pairs.

Post-Harvest Applications

Before PDP began collecting data, most available information on pesticide use in the United States was limited to pesticides applied to sustain agricultural production (pre-harvest applications). Little was known about pesticides applied to preserve the fruit and vegetable products after harvest (post-harvest applications). PDP's database has since become one of the most comprehensive sources of post-harvest pesticide use patterns because samples are collected at points where such uses have already taken place. Most post-harvest applications are confined to fungicides (to control mold and fungus) and growth regulators (to prevent sprouting). PDP compounds with mostly post-harvest applications are the fungicides diphenylamine, o-phenylphenol, thiabendazole, and the growth regulator chlorpropham. Other compounds with post-harvest uses on selected commodities are the fungicides dicloran (carrots and peaches) and imazalil (citrus). Consequently, residues from these pesticides can be assumed to result from post-harvest applications. To illustrate the impact of post-harvest uses, detections including and excluding residues of these compounds are listed in Tables 3A and 3B, respectively. Significant differences in the number of residue detections as a result of post-harvest uses are in apples, bananas, oranges, potatoes, and, to a lesser extent, peaches. As these tables indicate, the 5 fungicides listed above, along with chlorpropham, accounted for 2,870 detections (29 percent of the number of residue detections in fruit and vegetables). The pesticide most frequently found in fruit and potatoes (1,146 detections) was the fungicide thiabendazole, representing about 11 percent of all detections. Wheat data presented in Appendix G indicates that the most frequently pesticides found were chlorpyrifos, chlorpyrifos methyl, and malathion. These three pesticides have pre- and post-harvest uses in wheat. These three pesticides account for 868 (96 percent) of the 904 residue detections in the 600 wheat samples tested. Malathion, the most prevalently detected residue, was found in 71 percent of the wheat samples tested.

Environmental Contaminants

<u>DDT, DDD, and DDE</u>

A total of 6,873 fruit and vegetable samples were screened for DDE metabolite of DDT. Use of DDT has been prohibited in the United States since 1972. However, due to the persistence of this chemical in the environment, residues of the DDE metabolite were detected in 10 percent of all samples tested. In some samples, the parent DDT and the DDD metabolite were also reported. Residues were found primarily in soil crops, carrots (37.6 percent), potatoes (15.0 percent),

Table 3A. Number of Samples and Residues Detected (Includes Post-Harvest Applications)

	Total Samples Analyzed	Samples with Residues Detected	% of Samples with Pesticides Detected	Different Residues Detected	Total Residue Detections
Fresh Fruits and Vegetables:					
Apples	695	657	95	30	2,097
Bananas	486	300	62	3	325
Carrots	703	498	71	29	1,005
Grapes	694	552	80	31	1,331
Green Beans	587	332	57	28	696
Oranges	700	589	84	17	1,086
Peaches	377	347	92	31	1,076
Potatoes	707	588	83	18	987
Spinach	634	526	83	34	1,254
Processed Vegetables:					
Sweet Corn	671	3	0	2	3
Sweet Peas	670	106	16	9	155

Number of Samples Analyzed = 6,924
Number of Samples with Pesticides Detected = 4,498
Percent with Pesticide Detections = 65.0%
Total Number of Residue Detections = 10,015
Total Number of Different Residues = 69

	Total Samples Analyzed	Samples with Residues Detected	% of Samples with Pesticides Detected	Different Residues Detected	Total Residue Detections
Grain:*					
Wheat	600	475	79	10	904

***** Includes pre- and post-harvest uses for chlorpyrifos, chlorpyrifos methyl and malathion

Table 3B. Number of Samples and Residues Detected (Excludes Post-harvest Applications)*

	Total Samples Analyzed	Samples with Residues Detected	% of Samples with Pesticides Detected	Different Residues Detected	Total Residue Detections
Fresh Fruits and Vegetables:					
Apples	695	556	80	27	1,215
Bananas	486	73	15	1	73
Carrots	703	498	71	26	997
Grapes	694	552	80	28	1,328
Green Beans	587	325	55	27	677
Oranges	700	167	24	14	197
Peaches	377	344	91	26	914
Potatoes	707	225	32	14	343
Spinach	634	526	83	34	1,253
Processed Vegetables:					
Sweet Corn	671	1	0	1	1
Sweet Peas	670	98	15	8	147

Number of Samples Analyzed = 6,924
Number of Samples with Pesticides Detected = 3,365
Percent with Pesticide Detections = 48.6%
Total Number of Residue Detections = 7,145
Total Number of Different Residues = 65

* Chlorpropham, Dicloran (carrots and peaches), Diphenylamine, Imazalil (citrus), o-Phenylphenol, and Thiabendazole

and spinach 49.2 percent). No findings were above the allowable levels established by FDA. DDE was not in the testing profile for wheat.

Single/Selective Residue Analyses

2,4-D

A total of 722 samples were tested for 2,4-D. Commodities tested were peaches, peas, potatoes, and sweet corn. No 2,4-D residues were detected.

ABAMECTIN

A total of 688 samples of oranges were tested for abamectin. No residues were detected in any of the samples tested.

BENOMYL

A total of 3,575 samples of carrots, grapes, oranges, peaches, spinach, and sweet corn were tested for benomyl, as the carbendazim metabolite. Carbendazim residues were detected in 0.5 percent of the samples tested. These residues found in carrots, grapes, and peaches were at levels below the established tolerances.

FENBUTATIN OXIDE (HEXAKIS)

A total of 1,187 samples of apples, grapes, oranges, and peaches were tested for Fenbutatin Oxide, and 2 of its metabolites. Fenbutatin Oxide residues were found in 6.5 percent of the samples tested. None were above EPA established tolerances.

FORMETANATE

A total of 1,019 samples of apples, oranges, and peaches were tested for formetanate. Approximately 5 percent of the samples were found to contain residues of this compound, all at levels below the established tolerance.

Non-Detected Residues

Approximately 35 percent of the samples analyzed had no detectable levels of pesticide residues. If post-harvest applications of pesticides are excluded, the percentage becomes approximately 51. Non-detected residues could happen because a pesticide was not applied, because it dissipates rapidly, or for various other reasons. Appendices E and G (Part II) show the number of non-detected residues by pesticide/commodity pair. There were other pesticide/commodity pairs with non-detected residues which were not included in Appendix E because they did not meet the criteria given above (i.e., established tolerances or EPA requested) or because they were analyzed by fewer than five of PDP laboratories.

Three pesticides, abamectin, fenamiphos, and terbufos, in the PDP fruit and vegetable testing system, Table 1-Part IA, were not detected in any of the samples tested. Abamectin undergoes rapid photolysis and degradation by soil microorganisms. Fenamiphos dissipates fairly quickly and likely was not present at detectable levels at the time samples were collected. Terbufos is not widely used in either of the two commodities for which it is registered. In Appendix G-Part II , 13 of the 23 pesticides referenced in Table 1-Part II for the wheat testing profile were not detected.

Multiple Residues Detections

The PDP database provides information that can be used by EPA in evaluating the incidence of multiple residues. These mutiple residues may derive from various sources, such as applications of more than one pesticide on a crop during a growing season, possible spray drift, or persistent environmental residues. The multiple residue information is particularly useful in responding to the 1993 National Research Council report, *Pesticides in the Diets of Infants and Children*, which recommended that coordinated recording of multiple residue scans would make possible more accurate evaluation of exposure distributions for multiple chemicals.

The distribution of multiple residues in PDP's database is included as Appendix F. Any exposure assessment of individual or multiple residues depends on the actual levels of the residues detected. PDP's 1995 data indicate that the total pesticide level in a sample is independent of the number of residues detected. Furthermore, there is no relationship between the number of residues and presumptive tolerance violations.

Presumptive Tolerance Violations

Tolerances are defined under Section 408 of the Federal Food, Drug, and Cosmetic Act as the maximum quantity of a pesticide residue allowable on a raw agricultural commodity. Tolerances are established by EPA for pesticides used on food crops. A violation occurs when a residue is found which exceeds the tolerance level or when a residue is found for which there is no tolerance for that particular crop. With the exception of meat, poultry, and egg products, for which USDA is responsible, tolerances for all other foods are enforced by FDA. When agencies with regulatory enforcement authority collect samples for tolerance enforcement purposes, they must adhere to a quick turnaround time and chain of custody protocols which allow them to detain the sampled lot until results are available.

PDP is not an enforcement program. Consequently, sample analysis does not have to be completed quickly (emphasis is placed on searching for residues at the lowest detectable levels--not on quick turnaround time) and sample collection does not interfere with commodity distribution. Therefore, when samples are reported to have residues, for which there is no tolerance established or which exceed the tolerance, they are designated as "presumptive tolerance violations" and reported as such to FDA regional and headquarters offices. This is done in accordance with a Memorandum of Understanding between USDA and FDA for the purpose of pinpointing areas where closer surveillance may be needed. FDA enforcement action on PDP samples generally is not a viable option due to the time lag from sample collection to data reporting. Presumptive tolerance violations for 1995 data are indicated in Appendix C and are discussed on the cover page.

Synopsis

In 1995, a total of 6,873 fruit and vegetable (plus 51 samples for SRM analysis) and 600 wheat samples were analyzed using MRMs. Analysis using SRMs was performed in certain commodities only. Accordingly, 688 samples were tested for abamectin; 722 were tested for 2,4-D; 3,575 were tested for benomyl; 1,187 for fenbutatin oxide; and 1,019 for formetanate. Pesticides detected included insecticides, herbicides, fungicides, and growth regulators. Also detected were DDT and its metabolites, although their presence is almost certainly due to environmental contamination, not the result of prohibited crop application.

Approximately 83 percent of samples tested were domestic, and 16.5 percent were imported (0.5 percent were of unknown origin). Of all fruit and vegetable samples tested, 263 (3.8 percent) were reported as presumptive tolerance violations, although most of these were for residues where no tolerance was established. There were no reported wheat sample violations. For fruit and vegetables, 65 percent of the samples contained at least one residue, whereas 79 percent of the 600 wheat samples contained at least one residue. It was also observed that, for certain commodities, post-harvest applications contribute significantly to the number of residues detected. Overall, levels of residues detected were below tolerances.

For more information on the Pesticide Data Program, contact William J. Franks, Jr., Director, AMS Science and Technology Division, at (202) 720-5231; or Robert L. Epstein, Deputy Director, at (202) 720-2158. You may also reach them by facsimile at (202) 720-6496.

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Appendix A

Sample Origin by Grower, Packer, or Distributor

Appendix A gives the number of samples per State or country of origin and the number of samples of unknown origin. Where available, origin of fresh commodities is determined by grower or packer information. For processed commodities, origin is determined primarily by packer or distributor.

As shown in Appendix A, samples collected and analyzed during 1995 originated from 39 States and 17 foreign countries.

APPENDIX A. SAMPLE ORIGIN BY GROWER, PACKER, OR DISTRIBUTOR
(Number of Samples per State/Country)

Part1.	AP	BN	CR	CS	GB	GR	OG	PC	PO	PS	SP	No. of Domestic	% of Total
States = 39						Domestic Samples							
Alabama									1			1	<0.1
Arizona			18		2	5	3	4	3		5	40	0.7
California	63		445	176	137	369	563	165	124	196	402	2640	45.9
Colorado	4		28	2	4	1	1	2	36	3	22	103	1.2
Delaware									10			10	0.2
Florida			21	25	159		101	1	33	23	16	379	6.6
Georgia			1	10	38		1	11		7	1	69	1.2
Idaho	13		1	26				1	148	30		219	3.8
Illinois				49				2	3	45	1	100	1.7
Indiana	2								1			3	0.1
Kentucky											1	1	<0.1
Louisiana					1						2	3	0.1
Maine	2			3					8	2	1	16	0.3
Maryland				2	1	1				3		7	0.1
Massachusetts	2		3						2		4	11	0.2
Michigan	52		80	23	11	4	1	3	36	23	38	271	4.7
Minnesota				77					17	65		159	2.8
Missouri				1								1	<0.1
Montana									6			6	0.1
Nebraska									3			3	0.1
Nevada					1				5			6	0.1
New Hampshire	2											2	<0.1
New Jersey	1		1	2	8			14	2	4	13	45	0.8
New York	61		5	40	12	2	2		55	33	15	225	3.9
North Carolina	7		1	9	37		1	1	3	11	5	75	1.3
North Dakota									6			6	0.1
Ohio	11			7	22				15	9	13	77	1.3
Oklahoma				22						24		46	0.8
Oregon	11		4	31	2				41	32	3	124	2.2
Pennsylvania	8			16	1			5	1	12	10	53	0.9
South Carolina	3			7				29		7	2	48	0.8
Tennessee				19	25					18	1	63	1.1
Texas	4		13	42	12		15	3	31	50	43	213	3.7
Utah	1		3						4			8	0.1
Vermont	2		1		1							4	0.1
Virginia	4			6	3					7	10	30	0.5
Washington	407		23	11	6		1	13	90	12	8	571	9.9
West Virginia	1							2			1	4	0.1
Wisconsin				45					18	44		107	1.9
No. of Domestics	661	0	648	651	483	382	689	256	702	660	617	5749	--
% of Total (nearest %)	95	0	92	97	82	55	98	68	99	99	97		83.0

Part 2.	AP	BN	CR	CS	GB	GR	OG	PC	PO	PS	SP	No. of Import	% of Total
Countries = 17						Imported Samples							
Argentina	3											3	0.3
Australia				2			7					9	0.8
Brazil						2						2	0.2
Canada	8		35	16	4				5	7		75	6.6
Chile	4					257		118				379	33.2
Colombia		54										54	4.7
Costa Rica		125										125	10.9
Equador		153										153	13.4
Guatemala		46										46	4.0
Honduras		47										47	4.1
Israel							1					1	<0.1
Mexico		16	19		80	46	2				14	177	15.5
New Zealand	13							1				14	1.2
Nicaragua		6										6	0.5
Panama		21										21	1.8
Peru						1						1	<0.1
South Africa	5					5						10	0.9
Unknown Country	1	18				1						20	1.7
No. of Import	34	486	54	18	84	312	10	119	5	7	14	1143	
% of Total (nearest %)	5	100	8	3	14	45	1	32	1	1	2		16.5

Part 3.	AP	BN	CR	CS	GB	GR	OG	PC	PO	PS	SP	No. of Unknown	% of Total
No. of Unknown Origin			1	2	20		1	2		3	3	32	--
% of Total (nearest %)	0	0	<1	<1	3	0	<1	<1	0	<1	<1		0.5
GRAND TOTALS =	**695**	**486**	**703**	**671**	**587**	**694**	**700**	**377**	**707**	**670**	**634**	**6924**	

Commodities
AP = Apples
BN = Bananas
CR = Carrots
CS = Sweet Corn
GB = Green Beans
GR = Grapes
OG = Oranges
PC = Peaches
PO = Potatoes
PS = Sweet Peas
SP = Spinach

Appendix B

Quality Assurance Program Elements

PDP's Quality Assurance (QA) program covers all aspects of data gathering, from sample collection to data reporting. QA protocols for sampling are designed to protect sample integrity from the time of collection to the time of delivery to the testing facilities. QA protocols for testing comprise all laboratory operations from the time of sample receipt to the time data are reported to PDP's central database. As described in this appendix, the QA program has five elements: 1) Standard Operating Procedures; 2) On-site reviews; 3) Proficiency Check Samples; 4) Quality Control Procedures; and 5) Method Performance and Confirmation Procedures.

APPENDIX B. QUALITY ASSURANCE PROGRAM ELEMENTS

1. Standard Operating Procedures - Written SOPs are in place to provide uniform administrative, sampling, and laboratory procedures. SOPs are revised annually to accommodate changes in the program. Before submission, data are reviewed by each Quality Assurance Unit for completeness and adherence to PDP requirements.

2. On-site Reviews - On-site reviews are performed to determine compliance with SOPs. Improvements in sampling, chain of custody, recordkeeping, and laboratory procedures are made as a result of on-site reviews.

3. Proficiency Check Samples - All facilities are required to participate in PDP's Check Sample Program. Check samples are issued to laboratories performing analysis with multiresidue methods and/or single/selective residue methods. Periodically, one to four prepared commodities, containing pesticide(s) of known quantities, are sent to the participating laboratories and tested under the same conditions as routine samples. The resulting data are used to determine performance equivalency among the testing laboratories, and to evaluate individual laboratory performance. During 1995, PDP laboratories received 2 proficiency sample sets consisting of 6 samples for multiresidue screening, 6 sets for single/selective residue screening, and a wheat multiresidue set.

4. Quality Control Procedures - PDP operating procedures for quality control (QC) are intended to assess method and analyst performance during sample preparation, clean-up, extraction, and, where applicable, derivatization. To maximize sample output and decrease the QC/sample ratio, samples are analyzed in analytical sets, which include the sample set and the following components.

a. Reagent Blank: An amount of distilled water, equivalent to the natural moisture content of the commodity, is run through the entire analytical process to determine glassware cleanliness and system integrity.

b. Matrix Blank: A previously analyzed sample of the same commodity, which contains either very low concentrations of known residues or no detectable residues, is divided into two portions. The first portion is used to give background information on naturally occurring chemicals, and the second one is used to prepare a matrix spike.

c. Matrix Spike(s): Prior to extraction, a portion(s) of matrix blank is spiked with marker pesticides to determine the accuracy of the analyst and instrument performance. Marker pesticides are compounds selected from different pesticide classes (organochlorines, organophosphates, carbamates), which have physical and chemical characteristics similar to those in the class they represent. The use of marker pesticides to monitor recoveries is a modification of PDP's previous requirements that called for spiking with all pesticides. Because of the large number of pesticides in the program, spiking with all compounds required several spike mixtures (to avert coelution problems), which, in turn, resulted in lengthy run times.

d. Process Control Spike: A compound of physical and chemical characteristics, similar to those of the pesticides being tested, is used to evaluate the analytical process on a sample-by-sample basis. Each of the analytical set components, except the reagent and matrix blanks, is spiked with process controls.

e. Storage Spikes: If a sample set is going to be frozen as a homogenate for more than 72 hours prior to analysis, analysts are required to prepare storage spikes. Storage spikes provide information on whether degradation has occurred while the sample was frozen, and are prepared in the same manner as matrix spikes. However, they do not replace the requirement to run a fresh matrix spike at the time of analysis.

5. Method Performance and Confirmation Procedures - Laboratories are required to determine the limits of detection (LOD) and limits of quantitation (LOQ) for each commodity/pesticide pair. LODs depend on matrix, analyte, and detector used, and range from 0.001 to 0.150 ppm. (*Information on specific LODs and LOQs is available upon request.*) Confirmation by mass spectrometry, or a suitable alternate detection system, is required for all initial determinations. If a detected residue does not have a tolerance, or it exceeds the established tolerance, the sample is reanalyzed in duplicate from the frozen homogenate, along with the appropriate blanks and a spike of the residue at the suspected level.

Appendix C

Distribution of Residues Detected by Pesticide

Appendix C shows residue detections for all pesticide/commodity pairs tested, including minimum and maximum concentrations reported and whether a tolerance is established for each pair.

In 1995, 6,924 samples were analyzed. A total of 263 samples (3.8 percent) were reported as presumptive violations. Nine samples (0.13 percent) exceeded the established EPA tolerance for the pesticide/commodity pair and 254 samples (3.7 percent) were reported for which no EPA tolerance was established. Domestic commodities accounted for 231 samples (87.8 percent). Imported commodities accounted for 26 samples (9.9 percent). Unknown origin commodities accounted for 6 samples (2.3 percent) of the presumptive violation samples.

Presumptive violations were reported for 316 residues, 9 residues (2.8 percent) exceeded an established EPA tolerance and 307 residues (97.2 percent) were reported for which there is no EPA tolerance. Approximately half of the reported presumptive violations (163) were in spinach.

Pesticide residue established tolerances for pesticide/commodity pairs in PDP span several orders of magnitude--from 0.05 ppm for chlorpyrifos/peaches, to 60.0 ppm for iprodione/grapes. Of the 263 reported samples containing violations (316 individual violations), 186 samples contained a single residue, 26 samples contained two residues, 7 samples contained three residues, and 1 sample contained 4 residue violations.

In some cases, a tolerance may or may not apply, depending on whether certain conditions are met. For example, residues of methamidophos in green beans are covered by a tolerance only if residues of acephate are also present. Of the 112 green bean samples found to contain residues of methamidophos, 108 were found in combination with acephate. Only four samples had methamidophos residues where acephate was not present and were reported as presumptive violations.

APPENDIX C. DISTRIBUTION OF RESIDUES DETECTED BY PESTICIDE

Pesticide		Number of Samples Screened	No. of Samples with Detections	% of Samples with Detections	Minimum Value Detected, ppm	Maximum Value Detected, ppm	Tolerance Level, ppm
1.	**Acephate**						
	Carrots (V-3)	701	3	0.4	0.006	0.021	NT
	Grapes (V-1)	690	1	0.1	0.006	0.006	NT
	Green Beans	587	120	20.4	0.005	2.2	3
	Spinach (V-29)	609	29	4.8	0.005	0.19	NT
	Total		**153**				
2.	**Aldicarb sulfoxide (metabolite)**						
	Oranges	691	1	0.1	0.015	0.015	0.3
	Total		**1**				
3.	**Atrazine**						
	Spinach (V-2)	610	2	0.3	0.030	0.030	NT
	Total		**2**				
4.	**Azinphos methyl**						
	Apples	691	320	46.3	0.010	0.46	2.0
	Grapes	690	3	0.4	0.010	0.17	5.0
	Green Beans	587	4	0.7	0.010	0.051	2.0
	Oranges	691	1	0.1	0.073	0.073	2.0
	Peaches	367	102	27.8	0.010	0.24	2.0
	Total		**430**				
5.	**Benomyl (analyzed as carbendazim)**						
	Carrots	700	3	0.4	0.084	0.084	0.2
	Grapes	688	9	1.3	0.084	0.48	10.0
	Peaches	371	6	1.6	0.084	1.1	15.0
	Total		**18**				
6.	**Captan**						
	Apples	691	98	14.2	0.010	2.0	25
	Carrots	555	3	0.5	0.010	0.020	2
	Grapes	689	255	37.0	0.010	2.8	50
	Green Beans	438	13	3.0	0.013	0.20	25
	Peaches	367	60	16.3	0.010	1.5	50
	Total		**429**				

Pesticide	Number of Samples Screened	No. of Samples with Detections	% of Samples with Detections	Minimum Value Detected, ppm	Maximum Value Detected, ppm	Tolerance Level, ppm
7. Carbaryl						
Apples	693	76	11.0	0.010	0.74	10
Grapes	690	19	2.8	0.011	0.38	10
Green Beans	586	18	3.1	0.011	1.6	10
Oranges	691	71	10.3	0.010	0.19	10
Peaches	367	54	14.7	0.10	4.8	10
Spinach	610	8	1.3	0.010	0.11	12
Sweet Peas	670	8	1.2	0.010	0.37	10
Total		**254**				
8. Carbofuran (parent only)						
Grapes	690	3	0.4	0.015	0.052	0.4
Total		**3**				
Carbofuran (parent and metabolite)						
Spinach (V-1)	610	1	0.2	0.17	0.17	NT
Total		**1**				
3-Hydroxycarbofuran (without parent)						
Grapes (X-3)	690	5	0.7	0.021	0.42	0.2
Total		**5**				
9. Chlorothalonil						
Green Beans	587	84	14.3	0.010	1.1	5
Peaches	353	1	0.3	0.065	0.065	0.5
Spinach (V-7)	597	7	1.2	0.009	0.052	NT
Total		**92**				
10. Chlorpropham						
Grapes (V-1)	689	1	0.1	0.027	0.027	NT
Green Beans	587	19	3.2	0.029	0.21	5
Peaches (V-1)	367	1	0.3	0.013	0.013	NT
Potatoes	707	482	68.2	0.013	11	50
Total		**503**				
11. Chlorpyrifos						
Apples	692	153	22.1	0.005	0.42	1.5
Carrots (V-6)	701	6	0.9	0.005	0.019	NT
Grapes (V-9)	690	56	8.1	0.005	0.16	0.5 R
Oranges	691	50	7.2	0.005	0.019	1.0
Peaches	367	60	16.3	0.005	0.034	0.05
Spinach (V-46)	610	46	7.5	0.005	0.11	NT
Total		**371**				
12. Cypermethrin						
Spinach (V-2)	288	2	0.7	0.11	0.49	NT
Total		**2**				

Pesticide	Number of Samples Screened	No. of Samples with Detections	% of Samples with Detections	Minimum Value Detected, ppm	Maximum Value Detected, ppm	Tolerance Level, ppm
13. Dacthal (DCPA)						
Green Beans	584	29	5.0	0.003	0.12	2
Spinach (V-30)	610	30	4.9	0.003	0.10	NT
Total		**59**				
14. DDT (parent)						
Carrots	265	21	7.9	0.010	0.026	3 #
Grapes	348	1	0.3	0.010	0.010	0.5 #
Green Beans	228	1	0.4	0.010	0.010	0.2 #
Potatoes	393	41	10.4	0.010	0.013	1 #
Spinach	517	86	16.6	0.005	0.11	0.5 #
Total		**150**				
DDD (metabolite)						
Carrots	266	3	1.1	0.002	0.006	3 #
Spinach	516	8	1.6	0.002	0.020	0.5 #
Total		**11**				
DDE (metabolite)						
Carrots	701	263	37.6	0.004	0.21	3 #
Grapes	690	11	1.6	0.004	0.012	0.5 #
Green Beans	587	8	1.4	0.004	0.023	0.2 #
Peaches	367	1	0.3	0.005	0.005	0.2 #
Potatoes	707	106	15.0	0.004	0.037	1 #
Spinach	610	300	49.2	0.004	0.54	0.5 #
Total		**689**				
15. Demeton S Sulfone						
Green Beans (V-4)	77	4	5.2	0.010	0.038	NT
Potatoes (V-3)	148	3	2.0	0.010	0.030	NT
Spinach (V-1)	70	1	1.4	0.010	0.010	NT
Total		**8**				
16. Diazinon						
Apples	693	7	1.0	0.005	0.020	0.5
Carrots	700	26	3.7	0.005	0.086	0.75
Grapes	690	7	1.0	0.005	0.037	0.75
Green Beans (X-1)	587	3	0.5	0.011	1.1	0.5
Peaches	367	23	6.3	0.005	0.16	0.7
Spinach	609	18	3.0	0.005	0.39	0.7
Sweet Peas	670	7	1.0	0.005	0.049	0.5
Total		**91**				

Pesticide	Number of Samples Screened	No. of Samples with Detections	% of Samples with Detections	Minimum Value Detected, ppm	Maximum Value Detected, ppm	Tolerance Level, ppm
17. Dicloran						
Apples (V-2)	693	2	0.3	0.005	0.005	NT
Carrots	701	3	0.4	0.010	0.45	10
Grapes	690	18	2.6	0.010	1.2	10
Green Beans	587	3	0.5	0.13	0.71	20
Peaches	367	156	42.5	0.005	12	20
Spinach (V-13)	610	13	2.1	0.005	0.02	NT
Total		**195**				
18. Dicofol						
Apples	692	7	1.0	0.008	0.48	5
Grapes	688	43	6.3	0.008	1.9	5
Green Beans	587	1	0.2	0.008	0.008	5
Oranges	691	1	0.1	0.008	0.008	10
Peaches	367	4	1.1	0.25	0.40	10
Total		**56**				
19. Dieldrin						
Spinach	133	2	1.5	0.005	0.020	0.05 #
Total		**2**				
20. Dimethoate (see omethoate)						
Apples	693	26	3.8	0.004	0.43	2
Grapes	689	93	13.5	0.004	1.1	1
Green Beans	587	24	4.1	0.004	0.78	2
Oranges	691	3	0.4	0.004	0.005	2
Peaches (V-4)	367	4	1.1	0.004	0.35	NT
Spinach (X-1)	609	31	5.1	0.004	11	2
Sweet Peas	670	77	11.5	0.004	0.074	2
Total		**258**				
21. Diphenylamine						
Apples	691	489	70.8	0.013	5.1	10
Bananas (V-1)	479	1	0.2	0.15	0.15	NT
Grapes (V-1)	677	1	0.1	0.014	0.014	NT
Peaches (V-1)	285	1	0.4	0.017	0.017	NT
Potatoes (V-1)	692	1	0.1	0.057	0.057	NT
Total		**493**				
4-Hydroxydiphenylamine (metabolite)						
Apples	5	5	100.0	0.28	0.52	10
Total		**5**				
22. Disulfoton (parent)						
Apples (V-1)	693	1	0.1	0.11	0.11	NT
Potatoes	707	1	0.1	0.005	0.005	0.75
Total		**2**				

Pesticide	Number of Samples Screened	No. of Samples with Detections	% of Samples with Detections	Minimum Value Detected, ppm	Maximum Value Detected, ppm	Tolerance Level, ppm
23. Endosulfans						
Apples	693	46	6.6	0.005	0.15	2.0
Carrots	701	25	3.6	0.005	0.024	0.2
Grapes	690	28	4.1	0.003	0.22	2.0
Green Beans	587	139	23.7	0.003	0.77	2.0
Oranges (V-14)	691	14	2.0	0.003	0.005	NT
Peaches	367	29	7.9	0.003	0.18	2.0
Potatoes	707	137	19.4	0.003	0.096	0.2
Spinach	610	87	14.3	0.003	1.8	2.0
Sweet Corn	671	1	0.1	0.003	0.003	0.2
Sweet Peas	670	2	0.3	0.008	0.009	2.0
Total		**508**				
24. Esfenvalerate						
Apples	551	2	0.4	0.036	0.036	2.0
Carrots	561	2	0.4	0.020	0.020	0.5
Green Beans	474	23	4.9	0.020	0.16	2.0
Peaches	202	4	2.0	0.020	0.090	10
Total		**31**				
Fenvalerate						
Apples	693	1	0.1	0.17	0.17	2.0
Carrots	701	1	0.1	0.020	0.020	0.5
Grapes (V-1)	690	1	0.1	0.070	0.070	NT
Green Beans	587	1	0.2	0.020	0.020	2.0
Peaches	362	2	0.6	0.020	0.038	10.0
Spinach (V-1)	570	1	0.2	0.038	0.038	NT
Total		**7**				
25. Ethion						
Oranges	691	5	0.7	0.002	0.002	2.0
Total		**5**				
26. Fenbutatin Oxide						
Apples	351	13	3.7	0.005	0.51	15.0
Grapes	324	42	13.0	0.005	1.5	5
Oranges	345	3	0.9	0.005	0.005	20.0
Peaches	167	20	12.0	0.005	0.41	10.0
Total		**78**				
27. Formetanate Hydrochloride						
Apples	330	5	1.5	0.085	0.085	3
Oranges	522	18	3.4	0.083	0.19	4
Peaches	167	26	15.6	0.085	0.43	5
Total		**49**				

Pesticide	Number of Samples Screened	No. of Samples with Detections	% of Samples with Detections	Minimum Value Detected, ppm	Maximum Value Detected, ppm	Tolerance Level, ppm
28. Imazalil						
Bananas (X-1)	486	73	15.0	0.015	0.25	0.20
Oranges	691	395	57.2	0.011	0.61	10
Total		**468**				
29. Iprodione						
Apples (V-6)	693	6	0.9	0.014	0.025	NT
Carrots	701	173	24.7	0.014	0.13	5.0
Grapes	689	267	38.8	0.014	1.8	60.0
Green Beans	587	9	1.5	0.025	1.4	2.0
Peaches	367	256	69.8	0.025	13	20.0
Total		**711**				
30. Lambda Cyhalothrin and Isomer						
Spinach (V-1)	1	1	100.0	0.17	0.17	NT
Total		**1**				
31. Lindane						
Carrots	701	1	0.1	0.005	0.005	0.5
Green Beans	587	1	0.2	0.005	0.005	0.5
Spinach	610	2	0.3	0.006	0.023	1
Total		**4**				
32. Linuron						
Carrots	257	159	61.9	0.005	0.36	1
Spinach (V-1)	79	1	1.3	0.051	0.051	NT
Total		**160**				
33. Malathion						
Carrots	678	1	0.1	0.017	0.017	8
Oranges	691	2	0.3	0.005	0.013	8
Peaches	367	2	0.5	0.005	0.005	8
Spinach	610	4	0.7	0.005	0.028	8
Total		**9**				
34. Metalaxyl						
Carrots	18	7	38.9	0.005	0.024	0.5
Green Beans	19	6	31.6	0.005	0.005	0.2
Potatoes	44	6	13.6	0.005	0.020	0.5
Spinach	22	4	18.2	0.005	0.016	10.0
Total		**23**				

Pesticide	Number of Samples Screened	No. of Samples with Detections	% of Samples with Detections	Minimum Value Detected, ppm	Maximum Value Detected, ppm	Tolerance Level, ppm
35. Methamidophos						
Carrots (V-1)	701	1	0.1	0.004	0.004	NT
Grapes (V-1)	690	1	0.1	0.004	0.004	NT
Green Beans @ (V-4)	587	112	19.1	0.004	0.40	NT
Potatoes	707	14	2.0	0.004	0.038	0.1
Spinach (V-14)	609	14	2.3	0.004	0.034	NT
Total		**142**				
36. Methidathion						
Green Beans (V-1)	587	1	0.2	0.04	0.04	NT
Oranges	691	21	3.0	0.004	0.031	2.0
Total		**22**				
37. Methomyl						
Apples	693	24	3.5	0.012	0.13	1
Grapes	689	48	7.0	0.012	1.3	5
Green Beans	587	23	3.9	0.012	0.30	2
Peaches	367	3	0.8	0.026	0.10	5
Spinach	610	65	10.7	0.012	1.3	6
Total		**163**				
38. Methoxychlor						
Apples	693	110	15.9	0.010	0.70	14
Peaches	367	2	0.5	0.29	0.55	14
Sweet Peas	670	2	0.3	0.032	0.13	14
Total		**114**				
39. Mevinphos						
Grapes	690	5	0.7	0.003	0.044	0.5
Spinach	609	16	2.6	0.003	0.14	1.0
Total		**21**				
40. Myclobutanil						
Apples	678	8	1.2	0.014	0.033	0.5
Carrots (V-1)	701	1	0.1	0.014	0.014	NT
Grapes	689	172	25.0	0.014	0.44	1.0
Peaches	367	3	0.8	0.025	0.10	2.0
Total		**184**				
41. Omethoate (see Dimethoate)						
Apples	461	19	4.1	0.005	0.050	2
Grapes	530	92	17.4	0.005	0.37	1
Green Beans	379	13	3.4	0.005	0.077	2
Oranges	625	5	0.8	0.005	0.025	2
Peaches (V-2)	321	2	0.6	0.025	0.032	NT
Spinach	515	89	17.3	0.005	0.28	2
Sweet Peas	584	41	7.0	0.005	0.019	2
Total		**261**				

Pesticide	Number of Samples Screened	No. of Samples with Detections	% of Samples with Detections	Minimum Value Detected, ppm	Maximum Value Detected, ppm	Tolerance Level, ppm
42. Oxamyl						
Apples	693	29	4.2	0.015	0.088	2
Green Beans (V-1)	587	1	0.2	0.025	0.025	NT
Total		**30**				
43. Parathion						
Carrots	582	11	1.9	0.003	0.019	1
Grapes	662	5	0.8	0.003	0.010	1
Sweet Peas	670	1	0.1	0.003	0.003	1
Total		**17**				
44. Parathion methyl						
Apples	693	33	4.8	0.004	0.22	1
Carrots	701	2	0.3	0.005	0.010	1
Grapes	690	2	0.3	0.052	0.091	1
Peaches	367	104	28.3	0.004	0.45	1
Sweet Peas	670	9	1.3	0.004	0.005	1
Total		**150**				
45. Permethrins						
Apples (X-2)	693	3	0.4	0.016	0.14	0.05
Green Beans (V-5)	587	5	0.9	0.016	0.23	NT
Peaches	367	9	2.5	0.016	0.28	5.0
Spinach	610	372	61.0	0.016	18	20.0
Total		**389**				
46. o-Phenylphenol						
Apples	507	44	8.7	0.013	0.84	25
Carrots	563	4	0.7	0.017	0.017	20
Oranges	520	81	15.6	0.016	0.45	10
Peaches	245	3	1.2	0.015	0.062	20
Potatoes (V-31)	661	31	4.7	0.025	0.57	NT **
Spinach (V-1)	385	1	0.3	0.052	0.052	NT
Sweet Corn (V-2)	612	2	0.3	0.015	0.025	NT
Sweet Peas (V-8)	601	8	1.3	0.017	0.025	NT
Total		**174**				
47. Phorate (parent)						
Phorate Oxygen Analog sulfone (metabolite)						
Potatoes	63	4	6.3	0.005	0.005	0.5
Total		**4**				
Phorate sulfone (metabolite)						
Potatoes	315	14	4.4	0.004	0.055	0.5
Total		**14**				

Pesticide	Number of Samples Screened	No. of Samples with Detections	% of Samples with Detections	Minimum Value Detected, ppm	Maximum Value Detected, ppm	Tolerance Level, ppm
Phorate sulfoxide (metabolite)						
Potatoes	315	5	1.6	0.006	0.19	0.5
Total		**5**				
48. Phosalone						
Apples	421	3	0.7	0.10	0.22	10.0
Total		**3**				
49. Phosmet						
Apples	591	24	4.1	0.017	0.20	10
Carrots (V-3)	582	3	0.5	0.010	0.029	NT
Grapes	662	5	0.8	0.010	0.026	10
Peaches	321	59	18.4	0.010	1.1	10
Total		**91**				
50. Phosphamidon						
Apples	693	15	2.2	0.003	0.13	1
Potatoes	707	1	0.1	0.003	0.003	0.1
Total		**16**				
51. Piperonyl Butoxide						
Spinach (V-1)	1	1	100	3.6	3.6	NT
Total		**1**				
52. Propargite						
Apples	660	179	27.1	0.013	2.2	3
Grapes	689	33	4.8	0.014	1.5	10
Oranges	666	2	0.3	0.22	0.94	5
Peaches	367	73	19.9	0.033	1.2	7
Total		**287**				
53. Quintozene (PCNB parent, or parent and metabolites)						
Carrots (V-5)	701	5	0.7	0.005	0.022	NT
Green Beans	587	16	2.7	0.005	0.012	0.1
Potatoes	707	4	0.6	0.005	0.037	0.1
Total		**25**				
Hexachlorobenzene (HCB, impurity without parent)						
Carrots (V-1)	701	1	0.14	0.011	0.015	NT
Total		**1**				
Pentachloroaniline (PCA, metabolite without parent)						
Spinach (V-10)	133	10	7.5	0.005	0.013	NT
Total		**10**				

Pesticide	Number of Samples Screened	No. of Samples with Detections	% of Samples with Detections	Minimum Value Detected, ppm	Maximum Value Detected, ppm	Tolerance Level, ppm
Pentachlorobenzene (PCB, metabolite without parent)						
Carrots (V-1)	701	1	0.14	0.003	0.003	NT
Potatoes (V-1)	707	5	0.7	0.003	0.015	NT
Total		**6**				
54. Tecnazine						
Potatoes	105	2	1.9	0.015	0.045	* 25
Total		**2**				
55. Terbufos Sulfone						
Carrots (V-1)	327	1	0.3	0.004	0.004	NT
Total		**1**				
56. Thiabendazole						
Apples	664	349	52.6	0.013	5.7	10
Bananas (X-1)	486	251	51.6	0.013	0.46	0.4 ***
Carrots	693	1	0.1	0.050	0.050	10
Grapes	690	1	0.1	0.050	0.050	10.0
Oranges	683	413	60.5	0.010	1.4	10
Peaches (V-1)	367	1	0.3	0.050	0.050	NT
Potatoes	707	130	18.4	0.019	2.0	10.0
Total		**1146**				
57. Trifluralin						
Carrots	701	274	39.1	0.013	0.79	1.0
Total		**274**				
58. Vinclozolin						
Grapes	690	103	14.9	0.010	1.1	6.0
Green Beans (V-15)	472	15	3.2	0.036	0.26	NT
Peaches	367	5	1.4	0.007	0.062	25.0
Spinach (V-2)	610	2	0.3	0.039	0.044	NT
Total		**125**				

Total No. of Different Residues Detected:	69
Total No. of Samples Analyzed:	6924
Total No. of Residues Detected:	10015

KEY

(V) *Residue was found where no tolerance was established by EPA. Following V are the number of occurrences.*
(X) *Residue was found which exceeds EPA tolerance. Following X are the number of occurrences.*
NT *No tolerance level was set for that pesticide / commodity pair.*
@ *All other residues were detected in combination with acephate, for which a tolerance exists.*
R *Regional tolerance.*
*Number shown are Action Levels established by FDA.*
*** *Tolerance changed 09/27/95 to NT.*
**** *May be subject to Food Additive Tolerance due to packaging materials.*
***** *Tolerance applies to banana pulp only.*

Appendix D

National Estimates for Concentration Percentiles vs. Tolerance

Appendix D shows 52 pesticide/commodity pairs with detections in at least 10 percent of the samples tested. Concentrations detected are arranged in percentiles. The 90th percentile is compared to the tolerance established for each pesticide/commodity pair.

The meaning of a percentile can be most easily explained through an example. For the bananas-thiabendazole pair, the 50th percentile is estimated to be 0.014 ppm. This means that PDP estimates that at least 50 percent of bananas available to U.S. consumers had thiabendazole residues of 0.014 ppm or less, while at least 50 percent had residues of 0.014 ppm or more. Similarly, the 75th percentile (or the upper quartile) for this pair is estimated to be 0.088 ppm, which means that at least 75 percent of bananas had residues of 0.088 ppm or less, while at least 25 percent had residues of 0.088 ppm or more. Finally, the 90th percentile (or the last decile) is estimated to be 0.124 ppm, meaning that at least 90 percent of all bananas had thiabendazole residues of 0.124 ppm or less, while at least 10 percent had residues of 0.124 ppm or more.

When calculating the national estimates, PDP sampling data were weighted to more accurately reflect U.S. wholesale arrivals. This weighting had a surprising effect on the pair carbaryl / oranges (see page 1 of this appendix), for which detectable residues were found in 10.3 percent of the samples. When the sampling data were weighted to reflect U.S. arrivals (oranges are slightly more plentiful in winter months then at other times of the year), less than 9 percent of the total product available for consumption in 1995 was estimated to have detectable residues. Thus, the 90th percentile of carbaryl in oranges resulted in no value, even though more than 10 percent of the orange samples had detectable levels of carbaryl.

APPENDIX D. NATIONAL ESTIMATES FOR CONCENTRATION PERCENTILES vs. TOLERANCE
(Pairs with Residue Detections in at Least 10 Percent of Samples)

Commodity / Pesticide		% of Samples with Detections	Mean**		Percentiles			Ratio of 90th Percentile to Tolerance
			Lower	Upper	50th	75th	90th	
1.	**Apples**							
	Azinphos-Methyl	46.3	0.035	0.058	*	0.058	0.11	0.055
	Captan	14.2	0.016	0.027	*	*	0.022	0.001
	Carbaryl	11.0	0.018	0.048	*	*	0.015	0.002
	Chlorpyrifos	22.1	0.006	0.011	*	*	0.017	0.011
	Diphenylamine	70.8	0.554	0.562	0.20	0.94	1.5	0.150
	Methoxychlor	15.9	0.022	0.036	*	*	0.064	0.005
	Propargite	27.1	0.124	0.161	*	0.12	0.45	0.150
	Thiabendazole	52.6	0.464	0.503	0.075	0.61	1.5	0.150
2.	**Bananas**							
	Imazalil	15.0	0.011	0.039	*	*	0.035	0.175
	Thiabendazole	51.6	0.049	0.063	0.014	0.088	0.124	0.309
3.	**Carrots**							
	DDE	37.6	0.012	0.016	*	0.017	0.038	0.013
	Iprodione	24.7	0.012	0.037	*	*	0.050	0.010
	Linuron (a)	61.9	0.032	0.035	0.012	0.042	0.080	0.080
	Trifluralin	39.1	0.024	0.042	*	0.042	0.075	0.075
4.	**Grapes**							
	Captan	37.0	0.039	0.047	*	0.015	0.094	0.002
	Dimethoate	13.5	0.008	0.012	*	*	0.006	0.006
	Fenbutatin Oxide (b)	13.0	0.022	0.025	*	*	0.010	0.002
	Iprodione	38.8	0.077	0.094	*	0.050	0.25	0.004
	Myclobutanil	25.0	0.020	0.037	*	0.021	0.063	0.063
	Omethoate	17.4	0.007	0.013	*	*	0.015	0.015
	Vinclozolin	14.9	0.017	0.026	*	*	0.015	0.003
5.	**Green Beans**							
	Acephate	20.4	0.052	0.056	*	*	0.18	0.060
	Chlorothalonil	14.3	0.014	0.026	*	*	0.023	0.005
	Endosulfans	23.7	0.026	0.031	*	*	0.064	0.032
	Methamidophos	19.1	0.020	0.025	*	*	0.083	0.083
6.	**Oranges**							
	Carbaryl	10.3	0.004	0.020	*	*	***	***
	Imazalil	57.2	0.068	0.093	0.034	0.099	0.18	0.018
	o-Phenylphenol	15.6	0.008	0.026	*	*	0.026	0.003
	Thiabendazole	60.5	0.124	0.146	0.060	0.18	0.36	0.036

Commodity / Pesticide		% of Samples with Detections	Mean**		Percentiles			Ratio of 90th Percentile to Tolerance
			Lower	Upper	50th	75th	90th	
7.	**Peaches**							
	Azinphos-methyl	27.8	0.011	0.030	*	*	0.045	0.023
	Captan	16.3	0.042	0.050	*	*	0.061	0.001
	Carbaryl	14.7	0.089	0.105	*	*	0.25	0.025
	Chlorpyrifos	16.3	0.001	0.007	*	*	0.004	0.070
	Dicloran	42.5	0.517	0.520	0.01	0.34	1.3	0.065
	Fenbutatin Oxide (b)	12.0	0.006	0.009	*	*	0.006	0.001
	Formetanate HCl (b)	15.6	0.028	0.072	*	*	0.13	0.026
	Iprodione	69.8	0.816	0.824	0.21	0.65	1.7	0.085
	Parathion-methyl	28.3	0.025	0.030	*	0.033	0.069	0.069
	Phosmet	18.4	0.037	0.051	*	*	0.075	0.008
	Propargite	19.9	0.104	0.159	*	*	0.41	0.059
8.	**Potatoes**							
	Chlorpropham	68.2	1.129	1.133	0.12	1.7	3.5	0.070
	DDE	15.0	0.001	0.007	*	*	0.006	0.006
	DDT (c)	10.4	0.001	0.008	*	*	0.007	0.007
	Endosulfans	19.4	0.003	0.008	*	*	0.010	0.048
	Thiabendazole	18.4	0.078	0.123	*	*	0.25	0.025
9.	**Spinach**							
	DDE	49.2	0.011	0.014	*	0.014	0.030	0.060
	DDT (c)	16.6	0.003	0.008	*	*	0.015	0.030
	Endosulfans	14.3	0.015	0.019	*	*	0.010	0.005
	Methomyl	10.7	0.019	0.040	*	*	0.014	0.002
	Omethoate	17.3	0.010	0.029	*	*	0.027	0.014
	Permethrins	61.0	1.501	1.506	0.23	1.84	5.2	0.260
10.	**Sweet Peas**							
	Dimethoate	11.5	0.003	0.008	*	*	0.010	0.005

(a) Tested in only three States.
(b) In PDP for 6 months.
(c) Not reported in Ohio and inconsistent reporting in some other States.
* The percentile value is estimated to be below the Limit of Detection (LOD).
** The mean is estimated with a range of values. The lower bound is calculated with non-detections valued at zero. The upper bound is calculated using the LOD.
*** No estimated value.

Appendix E

Number of Non-Detected Residues by Pesticide/Commodity Pairs
(Pairs with established tolerances and pairs requested by EPA)

Appendix E gives the number of samples per commodity for which no pesticide residues were detected (non-detected) by the participating laboratories. Only pesticides with registered uses (i.e., established tolerances) and pesticides specifically requested by EPA are included. The appendix also shows the range of limits of detection for each pesticide.

The laboratories reported other non-detected residues which are not shown in this appendix but are available upon request. These include pesticides not expected to be present (i.e., not registered for use in PDP commodities). These data resulted from the laboratories' need to simplify spiking requirements for pesticides analyzed by multiresidue screens. For example, chlorpropham was tested in all samples although it is registered for use in only four PDP commodities--carrots, green beans, potatoes, and sweet peas. The number of non-detected residues for carrots and sweet peas is given in this appendix. Residues of chlorpropham were detected in green beans and potatoes; therefore, this information is shown in Appendix C.

APPENDIX E. NUMBER OF NON-DETECTED RESIDUES BY PESTICIDE/COMMODITY PAIRS

(Pairs with established tolerances and pairs requested by EPA)

	Pesticide	No. of Samples Analyzed	Range of LODs for Non-Detects, ppm	Tolerance Level, ppm
1.	**1-Naphthol**			
	Bananas	98	0.055 - 0.055	10
	Carrots	140	0.055 - 0.055	10
	Grapes	143	0.055 - 0.055	10
	Green Beans	113	0.055 - 0.055	10
	Potatoes	138	0.055 - 0.055	0.2
	Sweet Corn	140	0.055 - 0.055	5
	Sweet Peas	69	0.055 - 0.055	10
2.	**2,4-D (5)**			
	Peaches	133	0.006 - 0.010	0.2
	Sweet Corn	304	0.006 - 0.016	0.5
	Sweet Peas	285	0.006 - 0.010	1.0 (1)
3.	**Abamectin**			
	Oranges	688	0.002	NT
4.	**Acephate (5)**			
	Apples	693	0.003 - 0.030	NT
	Bananas	486	0.003 - 0.010	NT
	Oranges	691	0.003 - 0.030	NT
	Peaches	367	0.003 - 0.025	NT
	Potatoes	707	0.003 - 0.005	NT
	Sweet Corn	671	0.003 - 0.005	NT
	Sweet Peas	670	0.003 - 0.025	NT
5.	**Aldicarb & Metabolites**			
	Apples	499	0.007 - 0.040	NT
	Bananas	486	0.007 - 0.040	NT
	Carrots	509	0.007 - 0.040	NT
	Grapes	519	0.007 - 0.040	NT
	Green Beans	420	0.007 - 0.040	NT
	Oranges	675	0.007 - 0.036	0.3
	Peaches	367	0.007 - 0.040	NT
	Potatoes	531	0.007 - 0.015	1
	Spinach	599	0.007 - 0.040	NT
	Sweet Corn	629	0.007 - 0.020	NT
	Sweet Peas	540	0.007 - 0.036	NT

	Pesticide	No. of Samples Analyzed	Range of LODs for Non-Detects, ppm	Tolerance Level, ppm
6.	**Anilazine**			
	Apples	142	0.035 - 0.037	NT
	Oranges	142	0.035 - 0.037	NT
	Peaches	76	0.035 - 0.037	NT
	Spinach	133	0.035 - 0.037	NT
	Sweet Peas	69	0.035 - 0.037	NT
7.	**Atrazine**			
	Apples	693	0.018 - 0.030	NT
	Bananas	486	0.003 - 0.028	NT
	Carrots	701	0.018 - 0.030	NT
	Grapes	690	0.018 - 0.028	NT
	Green Beans	587	0.018 - 0.030	NT
	Oranges	691	0.003 - 0.030	NT
	Peaches	367	0.003 - 0.020	NT
	Potatoes	707	0.018 - 0.028	NT
	Sweet Corn	671	0.003 - 0.028	0.25
	Sweet Peas	670	0.003 - 0.028	NT
8.	**Azinphos Ethyl**			
	Apples	188	0.020 - 0.025	2
	Bananas	121	0.020 - 0.020	NT
	Carrots	194	0.020 - 0.025	NT
	Grapes	195	0.020 - 0.020	5
	Green Beans	172	0.020 - 0.025	2
	Oranges	199	0.020 - 0.025	2
	Peaches	99	0.020 - 0.020	2
	Potatoes	216	0.020 - 0.020	0.3
	Spinach	176	0.020 - 0.025	2
	Sweet Corn	186	0.020 - 0.020	NT
	Sweet Peas	186	0.020 - 0.020	NT
9.	**Azinphos Methyl**			
	Bananas	486	0.006 - 0.030	NT
	Carrots	701	0.006 - 0.130	NT
	Potatoes	707	0.006 - 0.029	0.3
	Spinach	610	0.006 - 0.130	2
	Sweet Corn	671	0.006 - 0.030	NT
	Sweet Peas	670	0.006 - 0.033	NT
10.	**Benfluralin**			
	Carrots	161	0.010 - 0.010	NT

	Pesticide	No. of Samples Analyzed	Range of LODs for Non-Detects, ppm	Tolerance Level, ppm
11.	**Benomyl**			
	Oranges	525	0.050	10
	Spinach	623	0.050	0.2
	Sweet Corn	668	0.050	0.2
12.	**Captan**			
	Bananas	377	0.006 - 0.017	NT
	Oranges	691	0.006 - 0.040	NT
	Potatoes	569	0.006 - 0.012	25 (2)
	Spinach	596	0.006 - 0.029	100
	Sweet Corn	531	0.006 - 0.012	2
	Sweet Peas	601	0.006 - 0.060	2
13.	**Carbaryl**			
	Bananas	486	0.006 - 0.036	10
	Carrots	701	0.006 - 0.076	10
	Potatoes	707	0.006 - 0.076	0.2
	Sweet Corn	671	0.006 - 0.076	5
14.	**Carbofuran & Carbofuran-3 OH**			
	Apples	693	0.009 - 0.076	NT
	Bananas	486	0.009 - 0.031	0.1
	Carrots	701	0.009 - 0.076	NT
	Green Beans	587	0.009 - 0.076	NT
	Oranges	691	0.009 - 0.049	2.5
	Peaches	367	0.009 - 0.049	NT
	Potatoes	707	0.009 - 0.076	1
	Sweet Corn	671	0.009 - 0.076	0.2
	Sweet Peas	670	0.009 - 0.076	NT
15.	**Chlorothalonil**			
	Apples	679	0.005 - 0.045	NT
	Bananas	374	0.003 - 0.008	0.05
	Carrots	548	0.006 - 0.045	1
	Grapes	530	0.006 - 0.008	NT
	Oranges	691	0.003 - 0.045	NT
	Potatoes	551	0.006 - 0.008	0.1
	Sweet Corn	516	0.006 - 0.008	1
	Sweet Peas	586	0.006 - 0.008	NT

Pesticide	No. of Samples Analyzed	Range of LODs for Non-Detects, ppm	Tolerance Level, ppm
16. Chlorpropham			
Apples	693	0.008 - 0.047	NT
Bananas	486	0.008 - 0.020	NT
Carrots	701	0.008 - 0.036	0.1
Oranges	691	0.008 - 0.047	NT
Spinach	610	0.008 - 0.300	0.3 (2)
Sweet Corn	671	0.008 - 0.020	NT
Sweet Peas	670	0.008 - 0.047	0.3 (2)
17. Chlorpyrifos (5)			
Bananas	486	0.003 - 0.020	0.01
Green Beans	587	0.003 - 0.020	0.1
Potatoes	707	0.003 - 0.011	NT
Sweet Corn	671	0.003 - 0.011	0.1
Sweet Peas	670	0.003 - 0.011	0.1
18. Cypermethrin			
Apples	265	0.045 - 0.060	NT
Bananas	153	0.003 - 0.060	NT
Carrots	104	0.060 - 0.060	NT
Grapes	153	0.060 - 0.060	NT
Green Beans	82	0.060 - 0.060	NT
Oranges	390	0.020 - 0.060	NT
Peaches	191	0.020 - 0.060	NT
Potatoes	177	0.060 - 0.060	NT
Sweet Corn	288	0.020 - 0.060	NT
Sweet Peas	243	0.045 - 0.060	NT
19. DCPA (Dacthal)			
Apples	693	0.002 - 0.068	NT
Bananas	486	0.002 - 0.010	NT
Carrots	701	0.002 - 0.068	NT
Grapes	690	0.002 - 0.008	NT
Oranges	691	0.002 - 0.068	NT
Peaches	367	0.002 - 0.010	NT
Potatoes	707	0.002 - 0.008	2
Sweet Corn	671	0.002 - 0.008	0.05
Sweet Peas	670	0.002 - 0.008	NT
20. DDE (DDT metabolite)			
Apples	693	0.002 - 0.012	0.1 (3)
Bananas	486	0.002 - 0.008	NT
Oranges	691	0.002 - 0.012	0.1 (3)
Sweet Corn	671	0.002 - 0.008	0.1 (3)
Sweet Peas	670	0.002 - 0.008	0.2 (3)

Pesticide	No. of Samples Analyzed	Range of LODs for Non-Detects, ppm	Tolerance Level, ppm
21. DDVP (Dichlorvos) (4)			
Apples	693	0.002 - 0.017	0.5
Bananas	486	0.002 - 0.013	0.5
Carrots	701	0.002 - 0.017	0.5
Grapes	690	0.002 - 0.004	0.5
Green Beans	587	0.002 - 0.017	0.5
Oranges	691	0.002 - 0.020	3
Peaches	367	0.002 - 0.014	0.5
Potatoes	707	0.002 - 0.004	0.5
Spinach	609	0.002 - 0.017	3
Sweet Corn	671	0.002 - 0.013	0.5
Sweet Peas	670	0.002 - 0.014	0.5
22. Demeton			
Apples	142	0.028 - 0.029	NT
Oranges	142	0.028 - 0.029	NT
Peaches	76	0.028 - 0.029	NT
Spinach	133	0.028 - 0.029	NT
Sweet Peas	69	0.028 - 0.029	NT
23. Demeton S & Metabolites			
Apples	93	0.006 - 0.060	NT
Bananas	58	0.006 - 0.060	NT
Carrots	87	0.006 - 0.060	NT
Grapes	125	0.006 - 0.060	NT
Oranges	129	0.006 - 0.060	NT
Peaches	51	0.006 - 0.060	NT
Sweet Corn	145	0.006 - 0.060	NT
Sweet Peas	144	0.006 - 0.060	NT
24. Diazinon (5)			
Bananas	486	0.003 - 0.022	0.1
Oranges	691	0.003 - 0.023	0.7
Potatoes	707	0.003 - 0.007	0.1
Sweet Corn	671	0.003 - 0.007	0.7
25. Dichlorobenzophenone, p p			
Apples	123	0.002 - 0.002	5
Bananas	74	0.002 - 0.002	NT
Carrots	104	0.002 - 0.002	NT
Grapes	153	0.002 - 0.002	5
Green Beans	82	0.002 - 0.002	5
Oranges	159	0.002 - 0.002	10
Peaches	57	0.002 - 0.002	10
Potatoes	177	0.002 - 0.002	NT
Spinach	78	0.002 - 0.002	NT
Sweet Corn	175	0.002 - 0.002	NT
Sweet Peas	174	0.002 - 0.002	NT

Pesticide	No. of Samples Analyzed	Range of LODs for Non-Detects, ppm	Tolerance Level, ppm
26. Dicloran			
Bananas	486	0.006 - 0.019	NT
Oranges	691	0.003 - 0.060	NT
Potatoes	707	0.006 - 0.010	0.25
Sweet Corn	671	0.006 - 0.010	NT
Sweet Peas	670	0.003 - 0.010	NT
27. Dicofols			
Bananas	486	0.005 - 0.020	NT
Carrots	701	0.005 - 0.050	NT
Potatoes	707	0.005 - 0.020	NT
Spinach	610	0.005 - 0.050	NT
Sweet Corn	671	0.005 - 0.020	NT
Sweet Peas	670	0.005 - 0.025	NT
28. Dieldrin			
Apples	142	0.003 - 0.003	NT
Oranges	142	0.003 - 0.003	0.02 (3)
Peaches	76	0.003 - 0.003	0.02 (3)
Sweet Peas	69	0.003 - 0.003	0.02 (3)
29. Dimethoate (6)			
Bananas	486	0.002 - 0.012	NT
Carrots	701	0.002 - 0.032	NT
Potatoes	707	0.002 - 0.007	0.2
Sweet Corn	671	0.002 - 0.011	NT
30. Diphenylamine (DPA)			
Carrots	701	0.008 - 0.110	NT
Green Beans	587	0.008 - 0.110	NT
Oranges	549	0.010 - 0.110	NT
Spinach	477	0.010 - 0.300	NT
Sweet Corn	671	0.008 - 0.015	NT
Sweet Peas	601	0.008 - 0.015	NT
31. Disulfoton			
Bananas	486	0.003 - 0.016	NT
Carrots	701	0.003 - 0.065	0.3
Grapes	690	0.003 - 0.016	NT
Green Beans	587	0.003 - 0.065	0.75
Oranges	691	0.002 - 0.065	NT
Peaches	367	0.003 - 0.036	NT
Spinach	609	0.003 - 0.065	0.75
Sweet Corn	671	0.003 - 0.013	0.3
Sweet Peas	670	0.003 - 0.036	0.75

Pesticide	No. of Samples Analyzed	Range of LODs for Non-Detects, ppm	Tolerance Level, ppm
32. Diuron			
Apples	123	0.010 - 0.030	1
Bananas	74	0.010 - 0.030	0.1
Carrots	104	0.010 - 0.030	NT
Grapes	153	0.010 - 0.030	1
Green Beans	82	0.010 - 0.030	NT
Oranges	159	0.010 - 0.030	1
Peaches	57	0.010 - 0.030	0.1
Potatoes	177	0.010 - 0.030	1
Spinach	78	0.010 - 0.030	NT
Sweet Corn	175	0.010 - 0.030	1
Sweet Peas	174	0.010 - 0.030	1
33. Endosulfans			
Bananas	486	0.002 - 0.006	NT
34. Esfenvalerate & Fenvalerate (5)			
Bananas	241	0.012 - 0.140	NT
Grapes	547	0.012 - 0.085	NT
Oranges	388	0.012 - 0.310	NT
Potatoes	569	0.012 - 0.050	0.02
Spinach	289	0.012 - 0.310	NT
Sweet Corn	403	0.012 - 0.050	0.1
Sweet Peas	490	0.012 - 0.050	1
35. Ethion			
Apples	693	0.001 - 0.032	2
Bananas	486	0.001 - 0.006	NT
Carrots	701	0.001 - 0.032	NT
Grapes	690	0.001 - 0.006	2
Green Beans	587	0.001 - 0.032	2
Peaches	367	0.001 - 0.008	1
Potatoes	707	0.001 - 0.004	NT
Spinach	610	0.001 - 0.032	NT
Sweet Corn	671	0.001 - 0.006	NT
Sweet Peas	670	0.001 - 0.008	NT
36. Ethoprop			
Apples	142	0.029 - 0.030	NT
Oranges	142	0.029 - 0.030	NT
Peaches	76	0.029 - 0.030	NT
Spinach	133	0.029 - 0.030	NT
Sweet Peas	69	0.029 - 0.030	NT

Pesticide	No. of Samples Analyzed	Range of LODs for Non-Detects, ppm	Tolerance Level, ppm
37. Fenamiphos & Metabolites			
Apples	693	0.002 - 0.049	0.25
Bananas	483	0.002 - 0.013	0.1
Carrots	701	0.002 - 0.049	NT
Grapes	690	0.002 - 0.009	0.1
Green Beans	587	0.002 - 0.049	NT
Oranges	691	0.002 - 0.049	0.6
Peaches	367	0.002 - 0.013	0.25
Potatoes	707	0.002 - 0.008	NT
Spinach	610	0.002 - 0.049	NT
Sweet Corn	671	0.002 - 0.013	NT
Sweet Peas	670	0.002 - 0.013	NT
38. HCB (Hexachlorobenzene) (7)			
Apples	693	0.002 - 0.006	NT
Bananas	486	0.002 - 0.006	0.1
Grapes	690	0.002 - 0.004	NT
Green Beans	587	0.002 - 0.006	0.1
Oranges	691	0.002 - 0.006	NT
Peaches	367	0.002 - 0.006	NT
Potatoes	707	0.002 - 0.004	0.1
Spinach	610	0.002 - 0.006	NT
Sweet Corn	671	0.002 - 0.004	NT
Sweet Peas	670	0.002 - 0.004	NT
39. Imazalil			
Apples	678	0.009 - 0.150	NT
Carrots	620	0.009 - 0.150	NT
Grapes	690	0.009 - 0.044	NT
Green Beans	587	0.009 - 0.150	NT
Peaches	367	0.009 - 0.055	NT
Potatoes	707	0.009 - 0.044	NT
Spinach	610	0.009 - 0.150	NT
Sweet Corn	671	0.009 - 0.044	NT (8)
Sweet Peas	670	0.009 - 0.055	NT
40. Iprodione			
Bananas	486	0.015 - 0.060	NT
Oranges	691	0.015 - 0.100	NT
Potatoes	707	0.008 - 0.060	0.5
Spinach	610	0.015 - 0.100	NT
Sweet Corn	671	0.008 - 0.060	NT
Sweet Peas	653	0.008 - 0.060	NT

	Pesticide	No. of Samples Analyzed	Range of LODs for Non-Detects, ppm	Tolerance Level, ppm
41.	**Lindane**			
	Apples	693	0.003 - 0.006	1
	Bananas	486	0.003 - 0.005	NT
	Grapes	690	0.003 - 0.006	1
	Oranges	691	0.003 - 0.006	0.5 (3)
	Peaches	367	0.003 - 0.005	1
	Potatoes	707	0.003 - 0.006	0.5 (3)
	Sweet Corn	671	0.003 - 0.006	0.5 (3)
	Sweet Peas	670	0.003 - 0.006	0.5 (3)
42.	**Linuron**			
	Apples	123	0.003 - 0.003	NT
	Bananas	74	0.003 - 0.003	NT
	Grapes	153	0.003 - 0.003	NT
	Green Beans	82	0.003 - 0.003	NT
	Oranges	159	0.003 - 0.003	NT
	Peaches	57	0.003 - 0.003	NT
	Potatoes	177	0.003 - 0.003	1
	Sweet Corn	175	0.003 - 0.003	0.25
	Sweet Peas	174	0.003 - 0.003	NT
43.	**Malathion**			
	Apples	693	0.002 - 0.049	8
	Bananas	477	0.002 - 0.038	NT
	Grapes	690	0.002 - 0.038	8
	Green Beans	587	0.002 - 0.049	8
	Potatoes	707	0.002 - 0.010	8
	Sweet Corn	671	0.002 - 0.013	2
	Sweet Peas	670	0.002 - 0.045	8
44.	**Metalaxyl**			
	Apples	18	0.003 - 0.003	0.2
	Grapes	16	0.003 - 0.003	2
	Oranges	18	0.003 - 0.003	1
	Peaches	1	0.003 - 0.003	1
	Sweet Corn	15	0.003 - 0.003	NT
	Sweet Peas	15	0.003 - 0.003	NT
45.	**Methamidophos (5)**			
	Apples	693	0.002 - 0.030	NT
	Bananas	486	0.002 - 0.012	NT
	Oranges	691	0.002 - 0.030	NT
	Peaches	367	0.002 - 0.019	NT
	Sweet Corn	671	0.002 - 0.005	NT
	Sweet Peas	670	0.002 - 0.019	NT

	Pesticide	No. of Samples Analyzed	Range of LODs for Non-Detects, ppm	Tolerance Level, ppm
46.	**Methidathion**			
	Apples	693	0.002 - 0.050	0.05
	Bananas	486	0.002 - 0.013	NT
	Carrots	701	0.002 - 0.050	NT
	Grapes	690	0.002 - 0.010	NT
	Peaches	367	0.002 - 0.016	0.05
	Potatoes	707	0.002 - 0.010	0.2
	Spinach	610	0.002 - 0.050	NT
	Sweet Corn	671	0.002 - 0.013	NT
	Sweet Peas	670	0.002 - 0.016	NT
47.	**Methiocarb**			
	Apples	298	0.015 - 0.064	NT
	Bananas	268	0.013 - 0.020	NT
	Carrots	162	0.015 - 0.016	NT
	Grapes	195	0.015 - 0.016	NT
	Green Beans	146	0.015 - 0.016	NT
	Oranges	466	0.015 - 0.064	0.02
	Peaches	264	0.013 - 0.064	15
	Potatoes	216	0.015 - 0.016	NT
	Spinach	438	0.013 - 0.064	NT
	Sweet Corn	314	0.013 - 0.020	0.03
	Sweet Peas	297	0.015 - 0.064	NT
48.	**Methomyl**			
	Bananas	486	0.007 - 0.060	NT
	Carrots	701	0.007 - 0.076	0.2
	Oranges	691	0.007 - 0.056	2
	Potatoes	707	0.007 - 0.076	0.2
	Sweet Corn	671	0.007 - 0.076	0.1
	Sweet Peas	670	0.007 - 0.076	5
49.	**Methoxychlor & Metabolites**			
	Bananas	486	0.006 - 0.028	NT
	Carrots	701	0.006 - 0.031	14
	Grapes	690	0.006 - 0.026	14
	Green Beans	587	0.006 - 0.031	14
	Oranges	691	0.006 - 0.031	NT
	Potatoes	707	0.006 - 0.026	1
	Spinach	610	0.006 - 0.031	14
	Sweet Corn	671	0.006 - 0.026	14

	Pesticide	No. of Samples Analyzed	Range of LODs for Non-Detects, ppm	Tolerance Level, ppm
50.	**Mevinphos**			
	Apples	693	0.002 - 0.096	0.5
	Bananas	486	0.002 - 0.019	NT
	Carrots	701	0.002 - 0.021	0.25
	Green Beans	587	0.002 - 0.021	0.25
	Oranges	691	0.002 - 0.096	0.2
	Peaches	367	0.002 - 0.096	1
	Potatoes	707	0.002 - 0.019	0.25
	Sweet Corn	671	0.002 - 0.019	0.25
	Sweet Peas	670	0.002 - 0.096	0.25
51.	**Myclobutanil**			
	Bananas	486	0.010 - 0.059	NT
	Green Beans	587	0.008 - 0.120	NT
	Oranges	691	0.010 - 0.120	NT
	Potatoes	707	0.008 - 0.059	NT
	Spinach	610	0.010 - 0.300	NT
	Sweet Corn	671	0.008 - 0.046	NT
	Sweet Peas	670	0.008 - 0.059	NT
52.	**o-Phenylphenol (5)**			
	Bananas	396	0.010 - 0.065	NT
	Grapes	614	0.008 - 0.065	NT
	Green Beans	474	0.008 - 0.066	NT
53.	**Oxamyl**			
	Bananas	486	0.009 - 0.043	0.3
	Carrots	701	0.009 - 0.076	0.1
	Grapes	690	0.009 - 0.076	NT
	Oranges	691	0.009 - 0.048	3
	Peaches	367	0.009 - 0.048	NT
	Potatoes	707	0.009 - 0.076	0.1
	Spinach	610	0.009 - 0.048	NT
	Sweet Corn	671	0.009 - 0.076	NT
	Sweet Peas	670	0.009 - 0.076	NT
54.	**PCB (Pentachlorobenzene)** (7)			
	Apples	693	0.002 - 0.006	NT
	Bananas	486	0.002 - 0.004	NT
	Grapes	690	0.002 - 0.004	NT
	Green Beans	587	0.002 - 0.006	0.1
	Oranges	691	0.002 - 0.006	NT
	Peaches	367	0.002 - 0.004	NT
	Spinach	610	0.002 - 0.006	NT
	Sweet Corn	671	0.002 - 0.004	NT
	Sweet Peas	670	0.002 - 0.004	NT

	Pesticide	No. of Samples Analyzed	Range of LODs for Non-Detects, ppm	Tolerance Level, ppm
55.	**PCNB (Quintozene)** (9)			
	Apples	693	0.003 - 0.006	NT
	Bananas	486	0.003 - 0.007	NT
	Grapes	690	0.003 - 0.006	NT
	Oranges	691	0.003 - 0.006	NT
	Peaches	367	0.003 - 0.007	NT
	Spinach	610	0.003 - 0.007	NT
	Sweet Corn	671	0.003 - 0.006	NT
	Sweet Peas	670	0.003 - 0.006	NT
56.	**Parathion Ethyl**			
	Apples	591	0.002 - 0.013	1
	Bananas	440	0.002 - 0.005	NT
	Green Beans	485	0.002 - 0.006	1
	Oranges	625	0.002 - 0.015	1
	Peaches	321	0.002 - 0.013	1
	Potatoes	707	0.002 - 0.006	0.1
	Spinach	516	0.002 - 0.013	1
	Sweet Corn	671	0.002 - 0.006	1
57.	**Parathion Methyl**			
	Bananas	486	0.002 - 0.013	NT
	Green Beans	587	0.002 - 0.034	1
	Oranges	691	0.002 - 0.034	1
	Potatoes	707	0.002 - 0.006	0.1
	Spinach	609	0.002 - 0.034	1
	Sweet Corn	671	0.002 - 0.013	1
58.	**Pentachloroaniline**			
	Apples	142	0.003 - 0.003	NT
	Oranges	142	0.003 - 0.003	NT
	Peaches	76	0.003 - 0.003	NT
	Sweet Peas	69	0.003 - 0.003	NT
59.	**Permethrins**			
	Bananas	486	0.005 - 0.040	NT
	Carrots	701	0.005 - 0.100	NT
	Grapes	690	0.005 - 0.040	NT
	Oranges	691	0.005 - 0.120	NT
	Potatoes	707	0.005 - 0.040	0.05
	Sweet Corn	671	0.005 - 0.040	0.1
	Sweet Peas	670	0.005 - 0.040	NT

	Pesticide	No. of Samples Analyzed	Range of LODs for Non-Detects, ppm	Tolerance Level, ppm
60.	**Phorate & Metabolites**			
	Apples	693	0.002 - 0.130	NT
	Bananas	486	0.002 - 0.110	NT
	Carrots	701	0.002 - 0.110	NT
	Grapes	690	0.002 - 0.110	NT
	Green Beans	587	0.002 - 0.110	0.1
	Oranges	619	0.002 - 0.130	NT
	Peaches	362	0.002 - 0.130	NT
	Spinach	610	0.002 - 0.130	NT
	Sweet Corn	671	0.002 - 0.110	0.1
	Sweet Peas	670	0.002 - 0.130	NT
61.	**Phosalone**			
	Bananas	241	0.006 - 0.020	NT
	Carrots	266	0.006 - 0.020	NT
	Grapes	348	0.006 - 0.020	10
	Green Beans	228	0.006 - 0.020	NT
	Oranges	553	0.006 - 0.064	3
	Peaches	290	0.006 - 0.064	15
	Potatoes	393	0.006 - 0.020	0.1
	Spinach	432	0.006 - 0.064	NT
	Sweet Corn	461	0.006 - 0.020	NT
	Sweet Peas	429	0.006 - 0.064	NT
62.	**Phosmet**			
	Bananas	440	0.006 - 0.030	NT
	Green Beans	485	0.006 - 0.024	NT
	Oranges	625	0.006 - 0.030	5
	Potatoes	707	0.006 - 0.024	0.1
	Spinach	516	0.006 - 0.030	NT
	Sweet Corn	671	0.006 - 0.030	0.5
	Sweet Peas	670	0.006 - 0.030	0.5
63.	**Phosphamidon**			
	Bananas	486	0.002 - 0.093	NT
	Carrots	701	0.002 - 0.093	NT
	Grapes	690	0.002 - 0.093	NT
	Green Beans	587	0.002 - 0.093	NT
	Oranges	619	0.002 - 0.080	0.75
	Peaches	362	0.002 - 0.080	NT
	Spinach	610	0.002 - 0.080	NT
	Sweet Corn	671	0.002 - 0.093	NT
	Sweet Peas	670	0.002 - 0.093	NT

Pesticide	No. of Samples Analyzed	Range of LODs for Non-Detects, ppm	Tolerance Level, ppm
64. Propargite			
Bananas	486	0.020 - 0.180	NT
Carrots	688	0.008 - 0.200	NT
Green Beans	572	0.008 - 0.200	20
Potatoes	707	0.008 - 0.087	0.1
Spinach	599	0.020 - 0.310	NT
Sweet Corn	671	0.020 - 0.150	0.1 (10)
Sweet Peas	670	0.008 - 0.150	NT
65. Tecnazine			
Apples	62	0.010 - 0.010	NT
Bananas	33	0.010 - 0.010	NT
Carrots	69	0.010 - 0.010	10
Grapes	84	0.010 - 0.010	10
Green Beans	54	0.010 - 0.010	20
Oranges	86	0.010 - 0.010	NT
Peaches	34	0.010 - 0.010	20
Spinach	49	0.010 - 0.010	NT
Sweet Corn	112	0.010 - 0.010	NT
Sweet Peas	111	0.010 - 0.010	NT
66. Terbufos & Metabolites			
Apples	693	0.002 - 0.071	NT
Bananas	486	0.002 - 0.025	0.025
Carrots	701	0.002 - 0.071	NT
Grapes	690	0.002 - 0.029	NT
Green Beans	587	0.002 - 0.035	NT
Oranges	633	0.002 - 0.071	NT
Peaches	367	0.002 - 0.030	NT
Potatoes	707	0.002 - 0.029	NT
Spinach	610	0.002 - 0.035	NT
Sweet Corn	671	0.002 - 0.029	0.05
Sweet Peas	670	0.002 - 0.030	NT
67. Thiabendazole			
Green Beans	572	0.011 - 0.180	NT
Spinach	607	0.030 - 0.300	NT
Sweet Corn	671	0.011 - 0.180	NT
Sweet Peas	670	0.011 - 0.180	NT

	Pesticide	No. of Samples Analyzed	Range of LODs for Non-Detects, ppm	Tolerance Level, ppm
68.	**Trifluralin**			
	Apples	693	0.003 - 0.090	NT
	Bananas	388	0.003 - 0.030	NT
	Grapes	547	0.008 - 0.030	0.05
	Green Beans	474	0.008 - 0.090	0.05
	Oranges	691	0.003 - 0.090	0.05
	Peaches	367	0.003 - 0.030	0.05
	Potatoes	569	0.008 - 0.025	0.05
	Spinach	610	0.003 - 0.090	0.05
	Sweet Corn	531	0.003 - 0.020	NT
	Sweet Peas	601	0.003 - 0.020	0.05
69.	**Vinclozolin**			
	Apples	693	0.005 - 0.023	NT
	Bananas	388	0.004 - 0.012	NT
	Carrots	561	0.006 - 0.023	NT
	Oranges	691	0.004 - 0.023	NT
	Potatoes	566	0.006 - 0.014	NT
	Sweet Corn	531	0.006 - 0.014	NT
	Sweet Peas	601	0.006 - 0.014	NT

(1) These are special tolerance applications of 2,4-D for western ditches and water hycinth control.

(2) This is an interim tolerance.

(3) Action Level's (AL) are established by FDA and are not considered to be the same as Tolerances. AL's are established based on the unavoidability of the pesticide and its persistence in the environment. PDP will treat AL's as tolerances for FDA reporting purposes.

(4) Diclorvos is the breakdown product of Naled and is included in the Naled tolerance expression in 40CFR180.215. Therefore, it is appropriate to use the Naled tolerances.

(5) The Food Additive (FA) tolerance has been recently interpreted by EPA (04/10/95) to be in effect if there is a clear evidence of pesticide use in a warehouse. If such evidence is absent, then one must assume a violation if there is no established 408 tolerance or the established tolerance is exceeded. Therefore, if the Sample Information Form indicates that any of the pesticides listed below were applied at the Warehouse/Terminal Market/Packing establishment, then see the corresponding CFR reference for applicable FA tolerances.

- 2,4-D (40 CFR 185.1450)
- Acephate / Methamidophos (40 CFR 185.100)
- Chlorpyrifos (40 CFR 185.1000)
- Diazinon (40 CFR 185.175)
- Esfenvalerate (40 CFR 185.1310)
- Fenvalerate (40 CFR 185.1300)
- o-Phenylphenol (40 CFR 176.210)

(6) Combined tolerance for dimethoate and/or omethoate, as per FDA revised policy.

(7) The tolerance for PCNB is used, but as a combined tolerance for PCNB. When PCB and or HCB are detected, they are considered as part of the combined tolerance for PCNB.

(8) May have an active Section 18 Crisis exemption.

(9) This is a combined tolerance for PCNB and its metabolites PCA (pentachloroaniline) and MPCPS (methyl pentachlorophenyl sulfide).

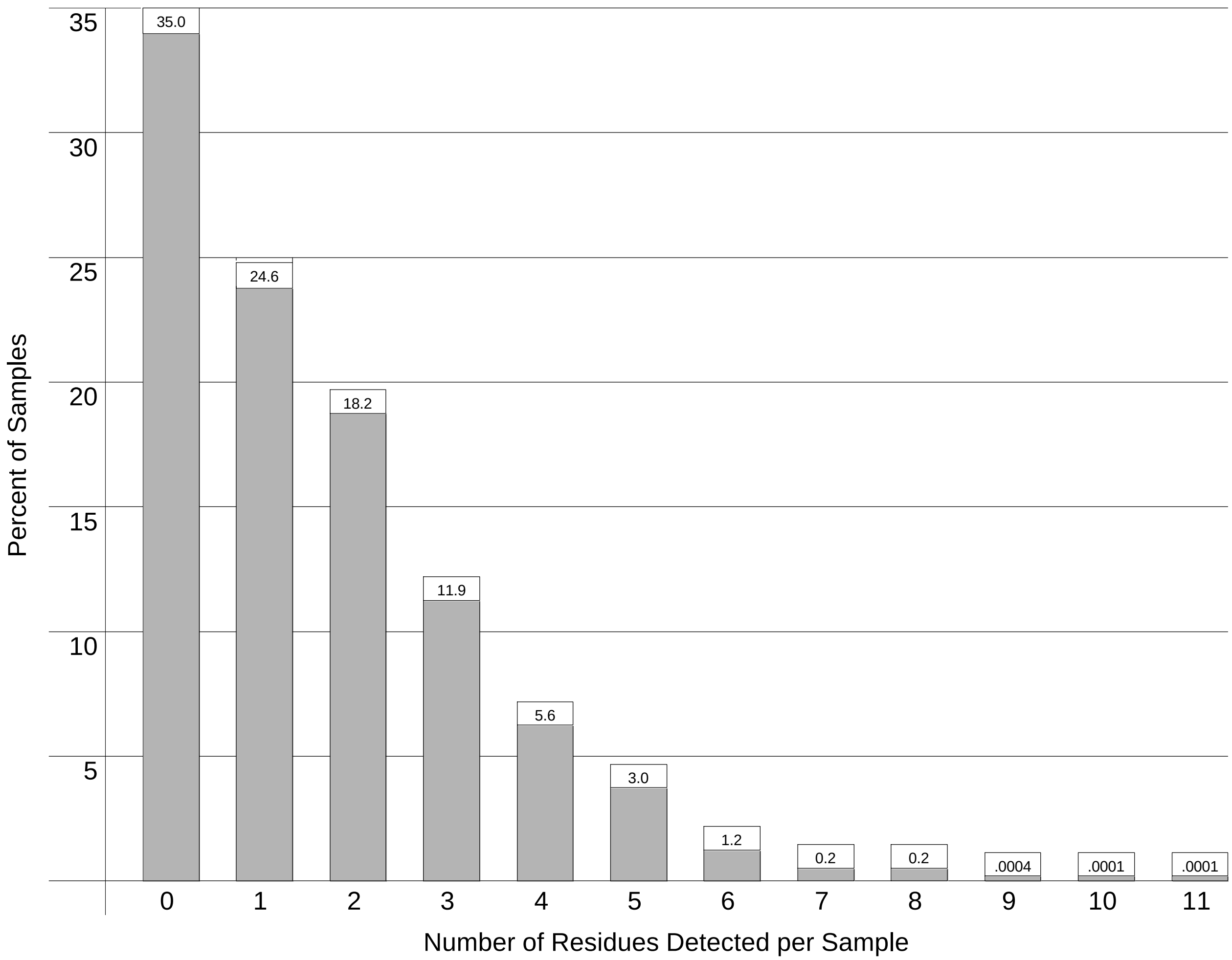
(10) Regional Tolerance -- California.

Appendix F

Percentage of Samples vs. Number of Residues Detected per Sample
(Fresh and Processed Commodities)

Appendix F shows the percentage of samples per commodity containing 0 to 11 residues per sample. Shown at the bottom of the graph are the overall number of samples and percentages (of the total number of samples analyzed) for each detection group. For example, of the 6,924 samples tested, 35.0 had no detectable residues and 40.3 percent had more than one residue.

APPENDIX F. PERCENTAGE vs. MULTIPLE RESIDUES DETECTED FOR FRUIT/VEGETABLE SAMPLES



Number of Residues Detected per Samples

	0	1	2	3	4	5	6	7	8	9	10	11
Number of Samples	2426	1706	1260	826	387	206	82	15	11	3	1	1
Percent of Total Samples	35.0	24.6	18.2	11.9	5.6	3.0	1.2	0.2	0.2	.0004	.0001	.0001

TOTAL NUMBER OF SAMPLES = 6,924

Appendix G

Distribution of Pesticide Residues in Wheat

Appendix G Part I shows residue detections for pesticides tested in wheat, including minimum and maximum concentrations reported and whether a tolerance is established by EPA for each pesticide/commodity pair. Part II references analyses for which no pesticide residues were detected by GIPSA. Of the 600 samples run 13 pesticides were routinely analyzed but not detected in any of the tested samples. Part II also shows the limit of detection for each pesticide.

APPENDIX G. DISTRIBUTION OF PESTICIDE RESIDUES IN WHEAT (600 Samples)

Part I. Detected Residues

Pesticide	# of Samples with Detections	% of Samples with Detections	Minimum Value Detected in ppm	Maximum Value Detected in ppm	Tolerance
Atrazine	4	0.7	0.004	0.004	0.25
Carbaryl	3	0.5	0.004	0.011	3.0
Chlorpyrifos	117	19.5	0.005	0.021	0.5
Chlorpyrifos methyl	325	54.2	0.002	3.3	6.0
Diazinon	18	3.0	0.007	0.028	0.05
Diclofop methyl	1	0.2	0.009	0.009	0.1
Imazalil	3	0.5	0.010	0.010	0.05
Malathion	426	71.0	0.002	2.9	8.0
Methoxychlor	6	1.0	0.013	0.13	2.0
Trifluralin	1	0.2	0.011	0.011	0.05 (N)

Part II. Non-Detected Residues

Pesticide	LODs for Non-Detections in ppm	Tolerance Level in ppm
Azinphos Methyl	0.008	0.2
Carbofuran & 3-OH Carbofuran	0.005	0.1*
Demeton S	0.006	NT
Dichlorvos (DDVP)**	0.003	NT
Dimethoate	0.009	0.04
Disulfoton and sulfone	0.003	0.3
Endosulfans	0.010	0.1
Linuron	0.010	0.25
Methomyl	0.005	1
Parathion Ethyl	0.013	1
Parathion Methyl	0.006	1
Phorate & sulfone	0.003	0.05
Triallate	0.010	0.05

(*) Carbamate only
(**) Dichlorvos - 331 samples
NT No Tolerance established
N Neglible Tolerance

Appendix H

Commodity History
(A Chronological Listing)

Appendix H shows a chronological listing of all commodities sampled since the inception of the program to the date of publication for the 1995 Summary.

APPENDIX H. Commodity History (A Chronological Listing)

Start Date	End Date	Commodity	Type
May 91	Dec 96	Grapes	Fresh
May 91	Dec 94	Lettuce	Fresh
May 91	Dec 95	Potatoes	Fresh
Aug 91	Dec 93	Grapefruit	Fresh
Aug 91	Dec 96	Oranges	Fresh
Sep 91	Dec 96	Apples	Fresh
Sep 91	Sep 95	Bananas	Fresh
Feb 92	Mar 94	Celery	Fresh
Feb 92	Dec 95	Green Beans	Fresh
Feb 92	Sep 96	Peaches	Fresh
Oct 92	Dec 94	Broccoli	Fresh
Oct 92	Sep 96	Carrots	Fresh
Apr 94	Mar 96	Sweet Corn	Canned/Frozen
Apr 94	Jun 96	Peas	Canned/Frozen
Jan 95		Spinach	Fresh
Feb 95		Wheat	Grain
Jan 96		Milk	Dairy
Jan 96		Green Beans	Canned/Frozen
Jan 96		Sweet Potatoes	Fresh
Jul 96		Tomatoes	Fresh
Jul 96		Apple Juice	Processed
Sep 96		Soy Beans	Grain
Dec 96		Peaches	Canned
Jan 97		Orange Juice	Processed
Jan 97		Pears	Fresh
Jan 97		Winter Squash	Fresh

PESTICIDE DATA PROGRAM

Annual Summary - Calendar Year 1995

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