United States Department of Agriculture
Agricultural Marketing Service, Science & Technology
Pesticide Data Program

SOP No.: PDP-QC		Page 1 of 41
Title: Chemical Compounds, PDP Commodity Grouping, Method Validation and Quality Control		
Revision: 5	Replaces: 10/01/2013	Effective: 10/01/2014

1. Purpose:

To provide a reference of PDP required compounds, a listing of available marker pesticides and process controls, specification of PDP commodity groupings, requirements for method validation and continuing quality control (QC) for USDA/AMS Pesticide Data Program (PDP) samples.

2. Scope:

This standard operating procedure (SOP) shall be followed by all analytical laboratories conducting pesticide residue studies for PDP, including support laboratories conducting stability or other types of studies that may impact the program.

3. Outline of Procedure:

Attachment 2 – PDP Compound Groups, Pesticides Codes and Multi-residue Compound Groupings for Fruit and Vegetables
Attachment 3 – EPA, Codex, and Food and Drug Administration (FDA) Pesticide Analytical Manual (PAM) Commodity Groupings
Attachment 4 – FDA Information
Attachment 5 – Method Evaluation Reporting Forms [LOD Verification, Determination of Method Range, Precision and Accuracy Data Collection]
Attachment 6 – Process Control and Spike Recovery Acceptability Flowchart

4. References:

- de Kok et. al., *The Stability of Pesticide Standards and Solutions*, 5th European Pesticide Residue Workshop, Stockholm, Sweden, June 13-16, 2004
- Avramides, *The Stability of Pure Standards and Stock Standard Solutions for Pesticide Residue Determination Using Gas Chromatography*, 5th European Pesticide Residue Workshop, Stockholm, Sweden, June 13-16, 2004
- Vieth et. al, *Storage Stability of Stock Solutions and Solid Pesticide Standards*, 5th European Pesticide Residue Workshop, Stockholm, Sweden, June 13-16, 2004
- National Environmental Laboratory Accreditation Conference (NELAC), *Standards*, Appendix D, Section D.1.1.2.1, Laboratory Control Samples (LCS), June 5, 2003
- U.S. FDA, *Standard Operating Procedures for the Total Diet Study*, KCM TD G2, revision 0, Quality Assurance, January, 1993
- Association of Official Analytical Chemists (AOAC), *Quality Assurance Principles for Analytical Laboratories*, 1991, pp. 91-94
- Garfield, F., *Quality Assurance Principles for Analytical Laboratories*, AOAC, 1991
- Taylor, J.T., *Quality Assurance of Chemical Measurements*, Lewis Publishers, 1989
- U.S. EPA, *Standard Operating Procedures*, 40 CFR part 160.81, August 17, 1989
- Federal Register, *Rules and Regulations*, Volume 49, Number 209, October, 1984
- Horwitz, W., *Evaluation of Analytical Methods Used for Regulation of Foods and Drugs*, Analytical Chemistry, Vol. 54, No. 1, pp. 67A-76A, 1982
- U.S. EPA, *Facilities for handling test, control, and reference substances*, 40 CFR 160.47
- U.S. EPA, *Reagents and Solutions*, 40 CFR 160.83
- U.S. EPA, *Test, control and reference substance characterization*, 40 CFR 160.105
- U.S. EPA, *Test, control, and reference substance handling*, 40 CFR 160.107
- U.S. EPA, *Mixtures of substances with carriers*, 40 CFR 160.113

- U.S. EPA, *Pesticide Use Index - Index of pesticide use sites: Corresponding Major Use Pattern(s) and Crop Group*, http://www.epa.gov/opp00001/regulating/usesite/terrestrial-food.pdf
- U.S. FDA, *Pesticide Analytical Manual Volume I (**PAM**) 3rd Edition*, Chapter 2, http://www.fda.gov/downloads/Food/ScienceResearch/LaboratoryMethods/PesticideAnalysisManualPAM/ucm111500.pdf
- Codex Alimentarius Commission, *Pesticide Residues in Food and Feed*, http://www.codexalimentarius.net/pestres/data/index.html

5. Specific Procedures:

This SOP represents minimum PDP requirements and is presented as a general guideline. Each laboratory shall have written procedures that provide specific details concerning how the procedure has been implemented in that laboratory.

5.1 Required Compounds

5.1.1 Refer to applicable commodity/compound-specific memoranda for commodity specific testing profiles.

5.1.2 Priority Levels

5.1.2.1 Each analyte of interest for each assigned commodity shall be designated with a priority level by the USDA/AMS. Priority levels for the individual compounds in the commodity-specific memoranda posted to the PDP Extranet are based on data needs identified by data users/stakeholders (e.g., U.S. Environmental Protection Agency, U.S. Food and Drug Administration, grower groups, industry, consumer/environmental groups), current tolerances and Action Levels (ALs), and national/international Maximum Residue Levels (MRLs). In addition, compounds that may not have tolerances in the U.S., but are known to be used in countries that export food to the U.S. are included; these compounds are comprised of compounds identified by EPA as having a high probability of consumption in selected imported products, and analytes identified by FDA or USDA Foreign Agricultural Service (FAS) as of interest in selected imported products, where applicable to a given commodity. It is recognized that not all compounds/metabolites on a given list are amenable to multiresidue testing and final screening lists will be determined based on method validation and ongoing testing results.

5.1.2.2 In the various commodity-specific memoranda (separate documents posted to the PDP Extranet), compounds identified as Priority 1 compounds are the most critical and those identified as Priority 4 are the least critical. The priority level is a combination of data needs and expected feasibility of current methods to recover a given compound. General priority levels are assigned according to the following protocol:

5.1.2.2.1 Priority 1 compounds are selected multiresidue-amenable pyrethroids, organophosphates, and carbamates and their associated metabolites. Priority 1 compounds are required for all commodities. These compounds are critical because they are scheduled for EPA Registration Review, as documented on the current EPA Office of Pesticide Programs Registration Review Schedule.

5.1.2.2.2 Priority 2 compounds include other multiresidue-amenable compounds with a current tolerance for the given commodity that are highly important because they also have upcoming reviews scheduled or have been identified by a stakeholder as a highly important data need. Cyphenothrin, imiprothrin, and tetramethrin are also included as priority level 2 compounds for all commodities. Additionally, chemicals used in other countries may be included as Priority 2 compounds, dependent upon their anticipated method behavior.

5.1.2.2.3 Priority 3 compounds include other analytes with tolerances (including food handing establishment tolerances) or ALs (e.g., environmental contaminants/extraneous residues – aldrin, BHC, chlordane, DDD, DDE, DDT, dieldrin, endrin, heptachlor, and heptachlor epoxide) for the given commodity and are routinely analyzed by multiresidue methods. Priority 3 compounds may also include chemicals used in other countries, dependent upon their anticipated method behavior.

5.1.2.2.4 Priority 4 compounds include pesticides that have current tolerances, but likely require single analyte methods (e.g., glyphosate/AMPA, paraquat/diquat, EBDCs). Priority 4 compounds may also include chemicals used in other countries, dependent upon their anticipated method behavior.

5.1.2.3 Laboratories should include all Priority 1 compounds, as many Priority 2 compounds as possible, and as many Priority 3 compounds as feasible.

5.1.2.4 In some cases, PDP will authorize the development of new methods to detect certain compounds (e.g., triazole metabolites, phenoxies, formetanate hydrochloride).

5.2 Standards

5.2.1 Ordering Analytical Standards

5.2.1.1 Standards may be obtained from the EPA Repository, registrants, or commercial vendors. When requesting standards from the Repository, identify your laboratory as a PDP laboratory in the comment section of the order form so that the Repository staff will know that the order takes precedence. If the request is urgent, note that in the Comment section of the order form as well.

The EPA repository is located at:

EPA National Pesticide Standard Repository
Environmental Science Center
701 Mapes Road
Fort Meade, MD 20755-5350
Phone: (410)305-2931
FAX: (410) 305-2999
http://www.epa.gov/pesticides/labs/standards_repository.html

5.2.1.2 Procurement of standards from all sources must meet the following minimum requirements:

Availability of a current and valid "Certificate of Analysis" (CoA) (as a minimum requirement the certification shall identify the substance, its purity, and the production lot), traceability, and current expiration date.

An exemption for CoA and current expiration date is allowed for extraneous environmental contaminants that are covered by FDA Action Levels and compounds that have been revoked and no longer have existing U.S. registrations. Extraneous environmental contaminants include aldrin, BHC, chlordane, DDT (and metabolites),

dieldrin, endrin, heptachlor (and metabolite), and lindane. Examples of revoked compounds that no longer have existing U.S. registrations include parathion ethyl, chlorfenvinphos, and fenchlorphos.

For all other analytical standards, in some cases, a current and valid CoA may not accompany the analytical standard. In this case, the laboratory shall contact the vendor to determine if one is available; if one is not available, the laboratory is exempt from the requirement to maintain a current and valid CoA for that standard.

5.2.2 Receipt of Analytical Standards

Custody of a standard begins when the standard is received in the laboratory. Each standard shall be given a code that uniquely identifies the standard from neat material to final dilutions. Receipt of standards shall be documented and each standard shall be traceable. Records shall include name, unique code, purity, lot number, date received, and expiration date (see 5.2.1.2 for exemption).

5.2.3 Storage of Analytical Standards

5.2.3.1 Neat standards shall be kept in a separate standards freezer, preferably at approximately -20°C or lower unless degradation occurs at such temperatures. In these cases, neat standards shall be stored at the recommended temperature.

5.2.3.2 Stock standards and dilutions including mixed standards shall be kept in refrigerators or freezers separate from those used for samples. Stock standards and dilutions shall be stored in teflon-lined, screw-capped, glass bottles or sealed glass ampules.

5.2.3.3 Access to the freezers and refrigerators shall be controlled and standards usage documented through the use of appropriate records (e.g., log books). These records shall contain at a minimum: standard name and/or unique code, date and time removed, initials of person removing standard, date and time returned, initials of person returning standard.

5.2.3.4 Refrigerator and freezer temperatures shall be checked either by taking readings each working day, or by automatic temperature recording devices.

5.2.3.5 When a neat standard is removed from freezer storage, the standard should be stored in a desiccator while it is brought to room temperature to minimize the potential for hydrolysis.

5.2.4 Preparation of Stock Standard Solutions

Stock standard solutions shall be prepared in a separate standard preparation area to avoid contamination of samples with pesticide standards. Each stock standard shall be given a unique identifying code and shall be labeled with a minimum of: pesticide name, concentration, solvent, date of preparation, initials of preparer, and expiration date of solution. Written SOPs for stock standard preparation shall include the method for preparing standards, calculations used in standard preparation, documentation that provides for standard traceability and safety guidelines.

5.2.5 Preparation of Intermediate Dilutions

Intermediate dilutions, including mixed standards, shall be prepared in a separate standard preparation area. Each standard shall be given a unique identifying code and shall be labeled with pesticide name, concentration, solvent, date of preparation, initials of preparer, and expiration date of solutions. Written SOPs shall include the method for standard preparation and documentation that provides for standard traceability.

5.2.6 Standard Checking

5.2.6.1 Stock solutions of neat pesticide standards not previously prepared or not currently in use in the laboratory shall be prepared in duplicate and the two standards compared to each other. Responses for standards of comparable concentrations must match within 15% relative percent difference (RPD):

$$RPD = \frac{|RF_1 - RF_2|}{\left[\frac{RF_1 + RF_2}{2}\right]} \times 100$$

where RF_1 is the response factor[1] of the first analytical standard and RF_2 is the response factor of the second standard. If standards do not match, a third standard shall be made and compared. This process shall be continued until two matching standards are prepared.

5.2.6.2 New stock solutions that are prepared from neat pesticides currently used in the laboratory shall be compared to the old stock solution. The two standards must match within 15% RPD. If the two standards do not match, the problem must be identified and solved before the standard is used for quantitation. A suggested approach is to make new dilutions of both the old and new standards to check for dilution errors. If no dilution errors are found, a second stock dilution should be made to determine whether an error was made in the original preparation from neat material. If these two stocks match, then the standard may be used. If they do not match, a third stock solution should be made. Whenever possible, duplicate injections shall be used.

5.2.6.3 Documentation of the standard checking process shall be kept through appropriate records (i.e. logs). Chromatograms of all standards shall be kept indicating the standard comparisons of old and new standards and the calculated difference.

5.2.7 Expired Standard Verification

If a laboratory has an expired neat analytical standard and cannot obtain a replacement with a valid expiration date from an approved PDP vendor or the EPA National Pesticide Standard Repository, with a deviation from USDA/AMS on file, the laboratory may proceed with validation and analysis of samples using the expired standard under the following conditions:

5.2.7.1 If the standard is recertified by the vendor and new documentation is obtained, it shall be recorded in the laboratory's standard records.

5.2.7.2 If the standard is not recertified, it shall be compared to an unexpired neat when one is available to verify its integrity.

5.2.7.2.1 If the two standards' response factors are within 15%, the expired standard being used shall be considered fit for purpose and this data shall be recorded in the laboratory's records.

[1] Area or height of each standard divided by the concentration of that standard.

5.2.7.2.2 If the two standards' response factors are not within 15%, USDA/AMS shall be contacted.

5.2.7.2.2.1 If there are residues, USDA/AMS and the laboratory's TPM and QAO shall develop an agreement on how to proceed with samples containing residues (e.g., re-extract and analyze with unexpired standard, code data as estimates, change to "unable to analyze," etc.). The agreement shall be documented and recorded in the laboratory's records. USDA/AMS will update any transmitted data in the USDA/AMS database.

5.2.7.2.2.2 If there are non-detects and the expired standard produces a response less than the response of the unexpired standard, the LOD shall be raised (consult with USDA/AMS to determine the level) and this information shall be recorded in the laboratory's records. USDA/AMS will update any transmitted data in the USDA/AMS database. The expired standard being used shall be considered fit for purpose for qualitative analysis only and this declaration shall be recorded in the laboratory's records.

5.2.8 Working Dilutions/Mixed Standards

5.2.8.1 Working dilutions and mixed standards shall be checked to ensure integrity of the solutions. These solutions should be made as frequently as necessary to ensure that concentrations do not change and/or individual pesticides do not degrade. Each laboratory shall determine the frequency of remaking dilutions/mixed standards. Documentation supporting this decision shall be maintained. A suggested guideline is six months for stock mixed standards and one month for working dilutions. Some pesticides may require more frequent dilution from the stock.

5.2.8.2 An archive file of all old mixed standards shall be kept and the dates the standards were used shall be indicated. The archive file shall be maintained a minimum of five years.

5.2.8.3 All working/mixed standards shall be identified by a unique and traceable code. Working/mixed standard records shall contain a minimum of pesticide name, solvent, date of preparation, expiration date, and preparer.

5.2.9 Detector Profiles

Standard retention time and response shall be characterized by analysis on the detectors used in each laboratory. These include but are not limited to: GC-ECD, GC-FPD, GC-ELCD, GC-XSD, GC-MSD, GC-ITD, LC-MS, and tandem MS. Libraries of all standards shall be developed for confirmatory instruments (GC-MS and LC-MS systems).

5.2.10 Disposal of Analytical Standards

Each laboratory shall establish the proper procedures for disposal (e.g., disposal by a licensed contractor) of expired analytical standards (both neat standards and dilutions). Disposal shall be in accordance with the laboratory's Chemical Hygiene Plan and shall be documented.

5.3 Method Validation Background

5.3.1 Marker compounds and commodity groups were created to facilitate the validation and ongoing QC of the enormous number of combinations of pesticides and commodities included in PDP. Each concept seeks to group pesticides or commodities by common properties and exploits these common properties to reduce the possible combinations to a manageable number.

5.3.2 This method evaluation framework makes the following assumptions:

5.3.2.1 Commodities are grouped in such a way that assessment of method performance in one commodity in the group can be extended to apply to all commodities in the group.

5.3.2.2 Marker pesticides are chosen to be representative of a broad range of similar pesticides. The assessment of method performance for these pesticides can be extended to apply to similar pesticides.

5.3.2.3 LOD is specific to a pesticide-commodity pair and must be evaluated for every pesticide-commodity pair.

5.3.2.4 Although a method may be extended to other commodities and pesticides, a minimum amount of LOD verification and recovery data must be obtained to confirm this assumption.

5.3.3 This SOP details various scenarios and their corresponding method validation requirements.

5.3.4 When problems occur, such as instrument reproducibility and/or linearity, an investigation of causes shall be conducted. A flow diagram is attached (*see Attachment 1 – Method Evaluation Flowchart*) which further clarifies these concepts.

5.4 General Method Validation Requirements

5.4.1 Methods selected for use by PDP laboratories, and significant changes to approved methods, are subject to prior approval by USDA/AMS.

5.4.2 The laboratory shall complete all required method validation modules, with the exception of precision and accuracy data collection (extracted, analyzed, and reviewed) prior to the extraction of any routine analytical sample sets.

5.4.3 An extraction/detection system includes the whole method: extraction, clean-up, chromatography, and analytical technique.

5.5 Method Validation Evaluation Guidelines

5.5.1 The following scenarios shall be followed for validation of new methods or changes/additions to existing methods. The following scenarios of changes/additions are possible:

5.5.1.1 Implementing a new method (5.6.1)

5.5.1.2 Changing an analytical method

5.5.1.2.1 Extraction (5.6.2.1)
5.5.1.2.2 Post-extraction/pre-instrumentation (5.6.2.2)
5.5.1.2.3 Instrumentation - new Limit of Detection (LOD) (5.6.2.3)
5.5.1.2.4 Minor Modifications (5.6.2.4)

5.5.1.3 Adding a new commodity grouping (5.6.3)

5.5.1.4 Adding a raw agricultural commodity or a processed commodity to an existing commodity group (5.6.4)

5.5.1.5 Adding pesticides related to marker pesticide groups to an existing commodity group (5.6.5). (*see Attachment 2 – PDP Compound Groups, Pesticides Codes and Multi-residue Compound Groupings for Fruit and Vegetable).*

5.5.1.6 Adding a new pesticide that is not related to marker pesticide groups to an existing commodity group. (5.6.6)

5.5.2 Evaluation takes place through the performance of method evaluation modules. These modules are chosen to meet the requirements of each scenario. The modules are:

- Establishment of LODs and Limits of Quantitation (LOQs) (5.10)
- Verification of LODs (5.11)
- Determination of Method Range (from 1xLOQ to 10xLOQ) (5.13)
- Precision and Accuracy Data Collection at 2xLOQ (5.14)
- Method Evaluation Reporting (5.15)

5.5.3 Section 5.6 of this SOP lists each scenario and the modules that must be performed in that scenario. Sections 5.10 through 5.15 outline the detailed procedures to be followed for each module.

5.6 Method Validation Scenarios

The TPM and Quality Assurance Officer (QAO) will determine which scenario described in the following subsections applies for the analytes/commodities/methods pairings *(see Attachment 2 –*

PDP Compound Groups, Pesticides Codes and Multi-residue Compound Groupings for Fruit and Vegetable). If local agreement cannot be reached, the PDP Technical Director shall be contacted to determine which modules should be performed.

5.6.1 New method implementation – Proceed with:

- Establishment of LODs and (LOQs) (5.10)
- Verification of LODs/LOQs for all compounds (5.11)
- Determination of Method Range for marker compounds (5.13)
- Precision and Accuracy Data Collection for all compounds (5.14)
- Method Evaluation Reporting (5.15)

5.6.2 Method changes

5.6.2.1 Major Extraction Change - Examples would be using a different solvent, solid phase extraction (SPE) sorbent bed, or a new technique. Proceed with:

- Establishment of LODs and (LOQs) (5.10)
- Verification of LODs/LOQs for all compounds (5.11)
- Determination of Method Range for marker compounds (5.13)
- Precision and Accuracy Data Collection for all compounds (5.14)
- Method Evaluation Reporting (5.15)

5.6.2.2 Major changes in post-extraction/pre-instrumentation procedures (cleanup) - Proceed with:

- Verification of LODs/LOQs for all compounds (5.11)
- Determination of Method Range for marker compounds (5.13)
- Precision and Accuracy Data Collection for all compounds (5.14)
- Method Evaluation Reporting (5.15)

5.6.2.3 Instrumentation Changes - The TPM and QAO will determine if the instrument change warrants completion of the following sections. *This is dependent upon the extent of modification. If local agreement cannot be reached, the PDP Technical Director shall be contacted for further resolution.*

For new LOD - Proceed with:

- Establishment of LODs/LOQs for all compounds (5.10)

- Verification of LODs/LOQs for all compounds (5.11)
- Method Evaluation Reporting (5.15)

The laboratory shall use best professional judgment to determine if Precision and Accuracy Data Collection (subsection 5.14) is necessary.

5.6.2.4 Minor modifications of existing method - The TPM and QAO will determine which portions of the following sections will be completed. *This is dependent upon the extent of modification. If local agreement cannot be reached, the PDP Technical Director shall be contacted to determine which sections should be performed.*

- Establishment of LODs and LOQs of affected analytes (5.10)
- Verification of LODs and LOQs of affected analytes (5.11)
- Determination of Method Range of affected markers (5.13)
- Precision and Accuracy Data Collection of affected analytes (5.14)
- Method Evaluation Reporting (5.15)

5.6.3 Adding a new commodity group - Proceed with:

- Verification of established LODs/LOQs for all required pesticides in the new commodity (5.11)
- Determination of Method Range for the marker pesticides (5.13)
- Precision and Accuracy Data Collection for all required analytes (5.14)
- Method Evaluation Reporting (5.15)

5.6.4 Adding a raw agricultural commodity or processed commodity (i.e., canned/frozen/dried/ juice) to an existing commodity group. Proceed with:

- Verification of established LODs/LOQs for all required pesticides (5.11)
- Precision and Accuracy Data Collection (2 points) for all required pesticides (5.14)
- Method Evaluation Reporting (5.15)

The laboratory shall use best professional judgment to determine if additional validation is necessary based on matrix behavior.

5.6.5 Adding pesticides related to the marker pesticide groups to an existing commodity group – Proceed with:

- Establishment of LODs and LOQs for each pesticide added (5.10)
- Verification of LODs/LOQs for each pesticide added (5.11)
- Precision and Accuracy Data Collection for each pesticide added (5.14)
- Method Evaluation Reporting (5.15)

5.6.6 Adding pesticides that are not related to the marker pesticide groups to an existing commodity group: (For example, the addition of imidacloprid analyzed by the same multiresidue procedure. The new pesticide may then become a marker pesticide for similar pesticides that are later added.) - Proceed with:

- Establishment of LODs and LOQs for each pesticide added (5.10)
- Verification of LODs and LOQs for each pesticide added (5.11)
- Determination of Method Range for compound(s) that are to become marker(s) (5.13)
- Precision and Accuracy Data Collection for each pesticide added (5.14)
- Method Evaluation Reporting (5.15)

5.7 Marker Pesticides

5.7.1 Assigning Compounds to Marker Groups

5.7.1.1 Compounds are placed into marker groups based on a combination of analyte chemistry and method performance behavior. Initial compound designations are made by the Technical Advisory Group (TAG), with applicable analytical laboratory input based on known method behavior, if those data are available. For new compounds, behavior data may not be available.

5.7.1.2 Final marker group assignment, and any marker group assignment changes, are based on laboratory experience. USDA/AMS maintains an "Effective Date" field that tracks initial group assignment as well as any changes in that initial assignment.

5.7.2 Multi-residue Screening

5.7.2.1 A laboratory may choose to use marker groups, rotate spike mixtures between analytical sets, or spike all compounds analyzed, as long as each extraction/detection system is adequately represented within each set.

5.7.2.2 For laboratories using marker groups, each laboratory shall select at least one compound from each applicable group (*see Attachment 2 – PDP Compound Groups, Pesticides Codes and Multi-residue Compound Groupings for Fruit and Vegetable)* to serve as a marker pesticide. Applicable groups are those that contain at least one compound analyzed by that laboratory for that commodity. For each applicable group, a marker pesticide shall be included for each extraction/detection system used to analyze that group.

5.7.2.3 For laboratories rotating spike mixtures between analytical sets, each laboratory shall ensure that each extraction/detection system is adequately represented within each set.

5.7.2.4 For laboratories analyzing multiple commodities, a single list of marker compounds may be specified to represent all commodities. The lists of required compounds for commodities analyzed should be combined and at least one compound from each applicable group chosen to serve as a marker compound.[2]

5.7.3 Selected/single analyte residue studies utilize the selected analyte as the marker pesticide.

5.7.4 "Marginal Performing Analytes" are analytes that do not meet linearity, calibration integrity, ion ratio, recovery (individual or mean), or precision and accuracy criteria during method validation or continuing quality control (QC) as specified in Section 5.18. Marginal performing analytes are determined in conjunction with USDA/AMS.

5.8 Process Control Compounds

Samples analyzed by each extraction/detection system shall include the analysis of a process control compound. More than one process control may be required. The laboratory shall make every effort to choose a compound that is not expected to be an incurred residue.

[2] For laboratories analyzing multiple commodities, compounds in single groupings only need apply to that required commodity.

5.9 PDP Commodity Groupings

Fruits and Vegetables: Apples (AP), Apple Juice (AJ), Applesauce (AC), Asparagus (AS), Avocado (AV), Baby Foods (see *Attachment* 3 for corresponding codes), Bananas (BN), Blueberries (BB), Broccoli (BR), Cabbage (CG), Canned Beans (BC), Canned beets (BT), Cantaloupe (CN), Carrots (CR), Cauliflower (CF), Celery (CE), Cherry Tomatoes (CT), Cilantro (CL), Cranberries (CA), Cucumbers (CU), Eggplant (EP), Grapefruit (GF), Grapes (GR), Grape Juice (GJ), Green Beans (GB), Green Onions (GO), Greens (GS), Honeydew Melons (HD), Hot Peppers (HP), Lettuce (LT), Mangoes (MA), Mushrooms (MU), Nectarines (NE), Onions (ON), Oranges (OG), Orange Juice (OJ), Papaya (YA), Peaches (PC), Pears (PE), Pear Juice (PJ), Peas (PS), Pineapples (PN), Plums (PU), Potatoes (PO), Raspberries (RS), Snap Peas (SN), Spinach (SP), Strawberries (ST), Summer Squash (SS), Sweet Bell Peppers (PP), Sweet Cherries (CH), Sweet Corn (CS), Sweet Potatoes (SW), Tangerines (TA), Tomatoes (TO), Watermelon (WM), Winter Squash (WS)

Cereal Grains (Low Oil): Barley (BY), Corn Grain (CO), Oats (OA), Rice (RI), Wheat (WH), Wheat Flour (WF)

Cereal Grains (High Oil): Almonds (AL), Peanut Butter (PB), Soybeans (SY),

Animal Tissue/High Protein: Beef (adipose – BA, liver – BL, muscle – BM), Catfish (FC), Eggs (EG), Pork (adipose – KA, muscle – KM), Poultry (adipose – PA, liver – PL, muscle – PM, breast – PR, thigh – PT), Salmon (FS)

Dairy Products: Butter (BU), Heavy Cream (CM), Milk (MK)

Water: Untreated Drinking Water (WU), Treated Drinking Water (WR), Bottled Water (WB), Groundwater (WG)

Single Commodities: For example, Corn Syrup (CY), Dairy-based Infant Formula (DF), Raisins (RA), Soy-based Infant Formula (YF), Tomato Paste (TP).

5.9.1 Based on their experience with a commodity, laboratories may request changes to the assigned commodity groupings from the PDP Technical Director.

5.9.2 Environmental Protection Agency (EPA), Codex, and Food and Drug Administration (FDA) Pesticide Analytical Manual (PAM) commodity grouping information can be found in attachments 3 and 4 of this SOP.

5.10 Establishment of LODs and LOQs

5.10.1 Method Noise

5.10.1.1 Method noise is the combination of instrument noise and the matrix noise contributions.

5.10.1.2 Method noise determination must be completed for all required PDP analytes.

5.10.1.3 Method noise will be determined utilizing instruments and operating conditions, which are routinely used for the analysis of samples. Noise for the LOD and LOQ calculations will be determined by examining chromatograms of the blank commodity in the chromatographic time segment of the pesticides of interest.

5.10.2 Establishment of LOD

5.10.2.1 LOD may be estimated by whatever means the laboratory chooses to employ, but the response shall be at least 3x signal to noise.

For MS systems, ions used for quantitation and for qualitative analysis/confirmation shall meet the 3x signal to noise requirement.

For example: 1) take two equal portions from the same matrix blank extract; 2) spike one aliquot with a known amount of the analyte of interest; 3) inject both aliquots under the same conditions; 4) magnify the baseline of the unfortified blank at the analyte retention time window of interest to obtain the instrument response for the tallest (height) or the broadest (area) noise; and 5) convert the response into concentration (ppm, ppb, or ppt) from the known concentration of the spiked extract. Compare the two concentrations (blank vs. spiked) to estimate the LOD.

5.10.2.2 LODs may be established at a level greater than 3x noise.

5.10.2.3 In addition to signal-to-noise considerations, LODs estimated for zero noise instruments (e.g,, triple quadrupoles) may also include consideration of replication injection data (e.g. injecting an LOD standard 10x).

5.10.2.4 The reported LOD shall be the highest value obtained using the validated method. For instance, for dual column systems, the confirmatory column LOD must be AT LEAST that of the primary/quantitative column.

5.10.2.5 For multi-peak compounds, such as many of the pyrethroids, the laboratory may base the LOD on the largest peak if a mass spectrometry system is used for both quantitation and confirmation. If other systems are used for quantitation, the laboratory may base the LOD on the larger peak if the smaller peak is <20% of the total response.

5.10.2.6 LOD is method dependent and shall be experimentally verified in matrix as detailed in Section 5.10.1.

5.10.3 Establishment of LOQ

5.10.3.1 LOQ will be calculated/determined for each analyte in each commodity tested following the establishment of LOD.

5.10.3.2 For all detection systems other than mass spectrometry, LOQ will be established by multiplying the response of method noise level by at least ten and then converting the total response into concentration (i.e., ppm, ppb, or ppt), or by multiplying the LOD by no less than ten/thirds (10/3) if the LOD is established above 3x method noise.

5.10.3.3 For mass spectrometric systems, ions to be used for qualitative analysis/confirmation shall be at least 3x signal to method noise. Ions to be used for quantitation shall be at least 10x signal to method noise.

5.10.3.3.1 In order to maximize the number of compounds screened by MS systems while maximizing the number of scans per second and dwell times, it may be

desirable to perform the initial identification and quantitation using fewer than three ions for some or all of the compounds. Presumptive-positive samples shall be re-injected or data reprocessed to meet all MS confirmation criteria.

5.10.3.4 The reported LOQ shall be the highest value obtained using the validated method.

5.11 Verification of LODs and LOQs

5.11.1 During method validation, all calculated or established LODs must be verified by fortifying duplicate blank commodities at approximately the LOD level and subjecting them to the analytical method for each extraction/detection system used in the analysis of PDP samples. If dual column is used for confirmation, LOD fortifications shall be analyzed on both columns, primary and confirmatory, for verification of LOD, and reported for both columns.

5.11.2 Verification consists of the observation of detectable peaks in the chromatogram at 3x the current noise level (run within the last three months). Variability is expected to be high. Therefore, recoveries can be reported as present or not present. If detectable peaks are not observed, the LOD must be re-estimated and the verification repeated.

5.11.3 Prepare summary form(s) of the acquired data for all systems and all columns used for analysis and/or confirmation *(see Attachment 5 - Method Evaluation Reporting Forms).*

5.11.4 For water only, the LOD for each reported compound shall be verified, at least every two years, by extraction of a single LOD spike. Reporting these results to MP is optional If the LOD Verification Form in Attachment 5 is used, then recording only one LOD spike is required.

5.12 Changing LODs

5.12.1 LODs may be raised for analytes in an individual sample set at the discretion of the TPM.

5.12.2 LODs may not be lowered without verification subject to the analytical method, TPM approval, and QAO review.

5.13 Determination of Method Range

5.13.1 During method validation, samples fortified with marker compounds (only marker compounds are required, however, other compounds may be used in addition to the markers, if desired) are to be run through the entire analytical method on the primary analytical system. If more than one type of chromatography system (e.g., GC versus LC) and/or detector system (e.g., FPD versus MSD) combinations are to be used for quantification, they must be likewise evaluated.

5.13.2 Fortify samples in triplicate at approximately 1xLOQ, 5xLOQ, and 10xLOQ for each marker or single analysis PDP analyte. Process these fortified samples through the entire analytical method. A reagent and matrix blank shall be subjected to the analytical method along with the fortified samples.

5.13.3 For each data point, calculate the Percent Recovery compared to known standards to three significant figures if greater than 100% or to two significant figures if less than 100%.

5.13.4 Calculate the mean Percent Recovery (%R) and Coefficient of Variation (%CV) for each level. A definition of Horwitz expected intralaboratory and interlaboratory %CVs may be found in SOP PDP-Glossary. The appropriate values may be used as a guideline when evaluating data.

5.13.5 Prepare summary form(s) of the acquired data by analyte, level, and commodity group *(see Attachment 5 - Method Evaluation Reporting Forms)*.

5.13.6 Method Range Extension

If more than 20 findings per life of the commodity for a particular analyte/commodity pair exceed the highest validated spiking level, then in order to verify the ability of the method to extract the analyte at the higher level, the laboratory shall fortify at least one spike at or above the level of the highest finding. Reagent and matrix blanks shall accompany these spikes. If the matrix spike recoveries do not meet QC criteria (per section 5.18) any affected findings shall be coded (or recoded) as estimates. Method range extension spikes may be reported via RDE as “other” spikes. Marker pesticide spikes may be used to represent other compounds in that group. Method range extension for a given commodity can represent another commodity in that group. Laboratories may perform the range extension at various times:

- preemptively during initial validation (based on intelligence or experience with the commodity),
- in subsequent batches following the high finding
- periodically (e.g. annually) to conserve resources, or
- internal blind check samples may be used for this purpose.

Method range extension results should be reported to USDA/AMS following QA review. USDA/AMS expects any **coding changes** for calendar year samples to be submitted by May 31st following the end of the calendar year. This does not remove the requirement to report all data sets for the calendar year by March 31 of the following calendar year.

5.14 Precision and Accuracy Data Collection

5.14.1 The precision and accuracy data collection shall be compiled from the commodity groupings as specified by USDA/AMS. Each marker, single analysis, new or other required PDP analyte shall be spiked at 2xLOQ and evaluated using a minimum of seven data points, with at least two points from each commodity in the group analyzed in a particular laboratory.

5.14.2 The required data points shall be obtained from:

- 2xLOQ data points completed after Determination of Method Range

and/or

- data points from matrix spikes analyzed concurrently with samples.

These two options provide slightly different data. The second option is preferable since it provides information about the repeatability of the method over time. The first option is permitted when running concurrent spikes would extend the data collection over more than six months and/or concurrent spikes would make the size of sample sets unmanageable.

5.14.3 For each data point, calculate the Percent Recovery compared to known standards to three significant figures if greater than 100% or to two significant figures if less than 100%.

5.14.4 Calculate the mean Percent Recovery (%R) and Coefficient of Variation (%CV) for each pesticide using the seven data points. A definition of Horwitz expected intralaboratory and interlaboratory %CVs may be found in SOP PDP-Glossary. The appropriate values may

be used as a guideline when evaluating data and/or determining whether analytes should be considered a Marginal Performing Analyte. In addition, Marginal Performing Analytes may be determined based on linearity, calibration integrity, or individual recovery values.

5.14.5 Prepare summary form(s) of the acquired data *(see Attachment 5 - Method Evaluation Reporting Forms*). Refer to Sections 5.17 for PDP acceptance criteria.

5.15 Method Evaluation Reporting

5.15.1 The methodology, method evaluation records, summary form(s), chromatograms, and any other supporting data generated during method evaluation shall be maintained by the laboratory.

5.15.2 Local Approval

5.15.2.1 Any request for and written modification of an approved analytical method shall be reviewed and approved by the QAO and TPM.

5.15.2.2 All validation documentation shall be reviewed and approved by the QAO and TPM.

5.15.3 Letter of Intent

5.15.3.1 Once the Verification of LODs and LOQs and Determination of Method Range has been completed, reviewed, and approved by the QAO and TPM, a Letter of Intent shall be submitted to the PDP Technical Director with copies to the Method Validation Coordinator and the assigned liaison chemist stating that these modules have been completed, reviewed, and approved and will be submitted at a later date with the Precision and Accuracy Data.

5.15.3.2 This letter shall also include a list of commodity(ies) and analyte(s) with their LOD(s) that the laboratory intends to analyze and shall be submitted within 90 days of the applicable commodity entering the program.

5.15.3.3 The Letter of Intent is not required if all required method validation data will be/is submitted within 90 days of the commodity entering the program.

5.15.3.4 USDA/AMS will perform a brief preliminary review and upon laboratory request, will issue a provisional letter of concurrence allowing the laboratory to transmit data to their liaison chemist for review while the full method validation package undergoes a multi-level review by USDA/AMS. Data may be changed, in consultation with the lab, based on the results from the full method validation package review.

5.15.4 Upon conclusion of the Precision and Accuracy Data Collection module, summary form(s) of validation documentation, and a brief narrative shall be sent to the PDP Technical Director with copies to the Method Validation Coordinator and the assigned liaison chemist with a cover memo detailing the submission (state which scenario(s) and module(s) that the submission is intended to represent). These may be sent by e-mail (preferred), hardcopy delivery (USDA/AMS PDP, 1400 Independence Ave, S.W. Washington DC 20250 or fax [(202) 619-1724].

5.15.5 A narrative accompanying the validation documentation shall include the following.

5.15.5.1 Description of the method.

5.15.5.2 Identification of any data that is only intended to be used for confirmation. Otherwise, USDA/AMS will evaluate the data as if quantitation will be performed on the instrument/analyte combination.

5.15.5.3 Requests for designation of any analytes as Marginal Performing Analytes - if USDA/AMS agrees to consider any analytes as Marginal Performing Analytes, that designation will be documented in the Letter of Concurrence.

5.15.5.4 Identification of previous method validation data used. The laboratory shall be responsible for clearly identifying the data used and the rationale for their use. For example, if a previously validated commodity returns and the laboratory has not made any method changes and will be using the same instrumentation, the laboratory shall submit a letter to USDA/AMS explaining how the previous validation data will be used.

Example narrative for a data package:

Enclosed is the complete method validation summary of all compounds we are screening for in commodity "y" to support the addition of the commodity to the 2010 PDP program. The specific scenario used in validation was 5.6.1, New Method Implementation. Required modules included establishment and verification of LODs and LOQs, determination of method range, precision and accuracy data collection, method evaluation reporting for GC/MSD, GC/FPD, GC/XSD, and LC/MS/MS instrumentation. For compound "a", GC/FPD is the primary detection system and LC/MS/MS data is intended for confirmation purposes only. The following analytes were dropped during method development due to difficulty in analysis (e.g., solubility, poor chromatography, sensitivity, and/or loss in SPE cleanup): compound "b", compound "c", and compound "d". Due to problems with recovery, the following analytes should be considered Marginal Performing Analytes and if it is agreed, will be coded as such in reporting: compound "e", compound "f", and compound "g". If there are questions about this submission please contact: XXXXXX. All references to this submission should use QA# ###-####.

Example narrative for a previously validated returning commodity with no method, analyte, or instrumentation changes:

In 2011, commodity "y" returned to the 2011 PDP program. This commodity was previously validated in 2008 and there have been no changes to the method, target analytes, and instrumentation since then. Therefore, the 2008 validation data submitted on Month, Day, Year, is still applicable. If there are questions about this submission please contact: XXXXXX. All references to this submission should use QA# ###-####.

An example format for the submission follows:

Title
Summary to include purpose, results, data anomalies.
Methods
Sample Preparation (example):

- 50g homogenized sample extracted with 100 ml ACN by gently mixing
- 5ml extract purified by a C-18 SPE cartridge, eluted with MeOH, and concentrated to 5ml

- 1 ml eluate further purified by florisil SPE and eluted with 5 ml 50:50 hexane/acetone
- Eluate dried down to 0.5 ml, re-suspended in acetone, and filtered
- Derivatizaton accomplished by reaction with dansyl chloride.

Analysis (example):

- Instrument GC/HPLC/detector
- Column (DB-)
- Post-column derivatization (where applicable).

5.16 Method Validation Evaluation by USDA/AMS

5.16.1 Letter of Intent

5.16.1.1 Letters of Intent shall be tracked and maintained in centralized files by the Method Validation Coordinator.

5.16.1.2 The USDA/AMS chemist assigned to that facility submitting a Letter of Intent shall review the letter and verify the submitted LOD/LOQ values against electronically submitted data (upon availability) and upon laboratory request issue a provisional letter of concurrence (see Section 5.15.3).

5.16.2 Method Validation Data Packages

5.16.2.1 After receipt by the PDP Technical Director, method validation data packages undergo a multi-tiered review by USDA/AMS. Details of this review process are specified in SOP PDP-ADMIN.

5.16.2.2 The method validation package is reviewed to ascertain the physical presence and completeness of data submitted for method validation and to determine whether these data adhere to PDP criteria and are to be considered validated.

5.16.2.3 For data that do not meet PDP criteria for linearity, calibration integrity, ion ratios, individual or mean recovery (50-150%) or reproducibility (%CV values within the expected Horwitz intralaboratory values) USDA/AMS and the laboratory shall use

scientific judgment to determine whether the compound shall be considered validated, designated as a Marginal Performing Analyte or designated as unvalidated for that pesticide/commodity pair.

Note: *The Horwitz values are used as guidelines only and do not preclude a compound from being considered validated.*

5.16.2.4 Once the USDA/AMS review of the method validation package has been completed, the laboratory TPM and QAO will receive a Letter of Concurrence that identifies the status of the instrument/detector results for the commodity/analyte pairing (e.g., validated, not validated, Marginal Performing Analyte, incomplete). If the data are deemed incomplete by USDA/AMS, the Letter of Concurrence will identify the deficiency and include a request for the remaining data e.g., monitoring of daily matrix fortifications or addition of a spike compound with the same functional group to the fortification profile).

5.16.2.5 Once a compound is designated as a Marginal Performing Analyte, that designation shall not be changed unless approved by the Technical Director.

5.17 Blanks and Spikes Required Per Set and Continuing QC

5.17.1 Sample set

A sample set is a group of samples, which are spiked individually with the designated process control(s), extracted with the required QC samples, and analyzed with the applicable required QC samples. Each set shall not exceed 35 samples. Required QC samples per set consist of a reagent blank, matrix blank, and matrix spike(s).

Each laboratory is given the option of combining two or more small sets into a larger set (e.g., peaches month A + peaches month B or apples month A + peaches month A). If the larger set contains two commodities, then the set shall contain a matrix blank of each commodity and a matrix spike(s) in at least one of the commodities.

5.17.2 Reagent Blank

A reagent blank is intended to demonstrate glassware cleanliness and total system integrity. It shall be prepared by subjecting an amount of distilled water equivalent to that contained in an average sample to the entire analytical process. For consistency in the preparation of the reagent blank, it shall be assumed that an "average" (includes fresh, canned, or frozen) fruit or vegetable sample contains 80% water. If contamination or interferences in the retention time window of the pesticide of interest is present in excess of the calculated LOQ, appropriate action must be taken and documented.

5.17.3 Matrix Blank

A matrix blank is intended to demonstrate the behavior of a substrate within an analytical system. Ideally, a matrix blank should be void of any compounds of interest. A matrix blank may be a previously characterized sample of the same commodity. If a suitable sample is not available, a portion of one of the samples may be randomly selected and used as a matrix blank. If an incurred residue is found in the matrix blank, which has been chosen from the sample set, determine if the same residue is incurred in the actual sample and is not present in other samples in the same set. If this condition cannot be met, appropriate action must be taken, such as reviewing reagent blank information.

5.17.4 Matrix Spike

A matrix spike is intended to reflect the behavior of a chemical in a substrate within an analytical system. The matrix spike indicates the behavior of the chemical for the entire sample set.

5.17.4.1 A second portion of the same material used for the matrix blank shall be used for the matrix spike(s). Laboratories may design their QC spiking schemes to meet their needs. A laboratory may choose to use marker groups as defined in Section 5.7 of this SOP, rotate spike mixtures between analytical sets, or spike all compounds analyzed, as long as each extraction/detection system is adequately represented within each set and the minimum requirement of all compounds reported by the laboratory to be spiked at least quarterly in each commodity, is met.

5.17.4.2 The spike shall be added prior to extraction at approximately 2x LOQ (or less). Additional spikes may be added to satisfy the quarterly spiking of each commodity with all reported compounds, as part of a validation study, or to familiarize a laboratory with pesticides that have not been previously analyzed. More than one matrix spike shall be required if necessary for all spiked compounds to be separated during the chromatographic process. If a laboratory has combined commodities within a set, then the QA/QC Recovery Form shall indicate which commodity was used for the matrix spikes. Results for all spiked compounds shall be reported to USDA/AMS through normal RDE procedures.

5.17.4.3 The matrix spike(s) shall meet the requirements specified in the criteria section below. All reported compounds (markers, required, and any other compound reported by that laboratory) shall be spiked at least quarterly for each commodity. All components of sample sets shall be subject to the same analytical process as detailed in the method SOPs.

5.17.4.4 Recoveries for compounds designated as Marginal Performing Analytes shall be coded with a "P" (Marginal Performing Analyte) in the Exception field of the QA/QC Recovery form.

5.17.4.5 If reported, recoveries for unvalidated compounds shall be coded with a "U" (Unvalidated Residue) in the Exception field of the QA/QC Recovery form.

5.17.4.6 Incurred residue levels may be subtracted from spike recovered prior to calculating the percent recovery if the conditions specified in SOP PDP-DATA are met.

5.17.5 Reporting Fortification Recoveries

5.17.5.1 "Fresh" spikes are matrix spikes fortified, extracted, and analyzed with that set of analytical samples. Fresh values reported may be the original, re-injected, re-aliquoted, or re-extracted (from homogenate) determination value. The results reported may be the value from primary detection system or the averaged value (e.g., dual column results averaged).

5.17.5.2 "Other" spikes are additional fortifications reported by the laboratory. The laboratory can request that USDA/AMS adds a new spike type code as needed.

Examples of "other spike" types are freezer, storage, failed fresh values, or "extra" QA spikes performed by the laboratory.

5.17.6 Quarterly 2xLOQ Spikes

5.17.6.1 All reported compounds (markers, required, and any other compounds reported by the laboratory) shall be spiked at least quarterly at 2x LOQ (or less) for each commodity.

5.17.6.2 The laboratory may choose to rotate spikes on a regular basis as long as the requirements in Subsection 5.17.4.1 are met.

5.17.6.3 The spike results shall be reported to USDA/AMS via RDE (the preferred option) or in Excel spreadsheets. Results shall also be addressed in the semi-annual QA Reports submitted to USADA/AMS.

5.17.7 Process Control Spikes

A process control spike is intended to assure the integrity of a particular sample within an analytical system.

5.17.7.1 Each sample set component, except the reagent and matrix blanks, shall be spiked with a process control at approximately 5x the Limit of Quantitation (LOQ) prior to the extraction step of the analytical procedure. However, if the intent of the process control is to monitor the percent recovery of a clean-up step, or of a derivatization, then the process control shall be added to the extract before the clean-up or derivatization step.

5.17.7.2 The laboratory shall make an effort to choose a compound that is not expected to be an incurred residue. The value reported as "percent recovery" may be the original, re-injected, re-aliquoted, or re-extracted (from homogenate) determination value [either value from primary detection system or averaged value (e.g., dual column results averaged)].

5.17.8 QA/QA Recovery Form Codes

The following codes shall be entered in the Exception field of the QA/QC Recovery form. See Section 5.17.4 for additional details.

Code	QA Spike Exception
E	Estimated
I	Incurred Residue
M	Matrix Interference
N	Not Recovered
P	Marginal Performing Analyte
S	Incurred Residue Subtracted
U	Unvalidated Residue

5.18 Criteria for Method Validation and Continuing QC

5.18.1 Method Validation Criteria

5.18.1.1 PDP criteria for percent recovery for determination of method range and precision and accuracy data collection is 50-150%.

5.18.1.2 Horwitz intralaboratory values are used as a guideline for determining reproducibility acceptability. The laboratory shall indicate any compounds that they feel are not acceptable and/or those that should be classified as Marginal Performing Analytes. These laboratory recommendations are subject to approval by USDA/AMS.

5.18.1.3 Some analytes may not meet method validation criteria for linearity, calibration integrity, ion ratios, recovery (individual or mean), or precision (%CV). Rather than not including them in the laboratory's screening list, USDA/AMS and the laboratory may decide that marginal data are preferable to no data. These compounds shall be designated as Marginal Performing Analytes. Details on USDA/AMS review of method validation data can be found in Section 5.15.

5.18.2 Matrix Spike Criteria

5.18.2.1 All spiked compounds shall have recoveries between 50 and 150%, within the statistically calculated range, or within a range agreed upon with USDA/AMS.

5.18.2.2 If a large number of analytes are in the spike, it becomes statistically likely that a few will be outside control limits. **This may not indicate that the system is out of control; therefore, corrective action may not be necessary.**

5.18.2.2.1 Some analytes may not be optimally recovered during method validation trials. Recoveries may be low and/or erratic and rather than not including them in the laboratory's screening list, the laboratory may consult with USDA/AMS to determine if marginal data may be preferable to no data. If reported by the laboratory, the codes for Marginal Performing Analytes shall be utilized. USDA/AMS will note the use of Marginal Performing Analytes in the Letter of Concurrence and the use of marginal performer codes for particular analyte/commodity pairs. Once a compound is designated as a Marginal Performing Analyte, that designation shall not be changed unless approved by the Technical Director.

5.18.2.2.2 Some analytes that behave acceptably during method validation may behave unacceptably during the analysis of routine batches. This may be due to the fact there is more commodity variability among actual samples than there is in the limited matrix utilized for method validation batches. As above, rather than dropping these analytes from the screening list, the laboratory should consult with USDA/AMS to determine if they should be reclassified as Marginal Performing Analytes. If a compound is reclassified as a Marginal Performing Analyte, an e-mail notification to the Technical Director, with a copy to the USDA/AMS liaison, shall be sent and approved/acknowledged by USDA/AMS, and that designation shall not be changed unless an e-mail communication is sent by the Technical Director reversing the previous approval.

5.18.3 Response To Failure To Meet Matrix Spike Criteria Range

If a spike analyte fails, even after re-injection/re-aliquoting, it can and should be reported, because the recovery may reflect normal random variation inherent to pesticide residue

analysis. For high recoveries, this practice is defensible. For low recoveries, best professional judgment should be used, although if recovery is 0%, that analyte should be reported as unable to detect in samples.

When a spiked pesticide recovery falls outside the range criteria, any one of the following options, or combination thereof, may be chosen by the TPM or designee. (See *Attachment 6 – Matrix Spike and Process Control Recovery Acceptability Flowchart.*)

5.18.3.1 The original extract may be re-injected or re-aliquoted. If the spiked pesticide recovery falls within the range criteria, then the results from the re-injected extract shall be reported.

5.18.3.2 The sample set may be re-extracted from the frozen homogenate. If the spiked pesticide recovery falls within the range criteria, the rerun results shall be reported.

5.18.3.3 The original results may be reported with an explanation (e.g., recovery exceed 150% but all samples in the set are non-detects for that analyte; wrong mix spiked; spike spilled but process controls in samples are acceptable; control charts indicate a recurrent analyte/matrix; etc.) The TPM and QAO shall ensure that reported data is not compromised and the explanation shall be conveyed to headquarters (e.g., note in RDE, email message to USDA/AMS liaison chemist and Technical Director).

5.18.3.4 Other options may be acceptable depending on the outcome of investigations and/or consultations with USDA/AMS. An explanation shall be conveyed to headquarters.

5.18.4 Process Control Criteria

Each laboratory shall decide whether to use the Absolute Range Criteria or the Statistically Calculated Range Criteria. A laboratory may choose different Range Criteria for different test types, but it is intended that a laboratory stay with the chosen criteria unless approved by the laboratory QAO.

5.18.4.1 Absolute Range

Each process control recovery shall fall between 50-150% for all detection systems used to calculate sample data.

5.18.4.2 Statistically Calculated Range

The mean recovery for a sample set's process control shall be calculated. Each process control recovery shall fall within its acceptance recovery range, which is the mean recovery plus and minus three standard deviations.

5.18.5 Response To Failure To Meet Chosen Process Control Criteria Range

If a process control fails, even after re-injection/re-aliquoting/re-extraction, the results may be reported, based on best professional judgment.

When a process control falls outside the chosen range criteria, any one of the following options, or combination thereof, may be chosen by the TPM or designee. (*See Attachment 6 – Process Control and Spike Recovery Acceptability Flowchart.*)

5.18.5.1 The original extract may be re-injected or re-aliquoted. If the process control recovery falls within the chosen range criteria, then the results from the re-injected or re-aliquoted extract shall be reported.

5.18.5.2 The sample may be re-extracted from the frozen homogenate. If the process control recovery falls within the chosen range criteria, the re-run results shall be reported.

5.18.5.3 The original results may be reported with an explanation (e.g., pipette error, the PC recovery exceeds 150% but all analytes in the sample are non-detects, etc.). The TPM and QAO shall ensure that reported data is not compromised and the explanation shall be conveyed to headquarters (e.g., note in RDE, email message to USDA/AMS liaison chemist and Technical Director).

5.18.5.4 Other options may be acceptable depending on the outcome of investigations and/or consultations with USDA/AMS. An explanation shall be conveyed to headquarters.

5.18.6 Evaluation of Recoveries

Laboratories shall use control charting or other appropriate statistical tools to evaluate recoveries on a set-to-set basis and monitor trends over time.

5.19 Proficiency Testing

5.19.1 PDP PT Program Overview

5.19.1.1 PDP Fiscal Year (FY) PT program schedules are posted to the PDP Extranet site and are referenced in the applicable PDP Semi-Annual Program Plans.

5.19.1.2 General multi-residue method samples for fruit and vegetables will be supplied by AOAC, the Food Analysis Performance Assessment Scheme (FAPAS), and the California Department of Food and Agriculture (CDFA).

5.19.1.4 Rounds for commodities other than fruit and vegetables (e.g., meat, milk and dairy products, fish, grains, nuts, etc.) shall be supplied by CDFA. Additionally, applicable FAPAS rounds may be scheduled.

5.19.1.5 PT samples received may be significantly larger than the analytical portion required by the laboratory for analysis. In cases where the PT sample is more than twice the analytical weight needed, the laboratory may subsample duplicate portions for extraction and analysis as described below, due to the uncertainty regarding homogeneity of samples. Sample results that meet the QC criteria shall be averaged for reporting.

5.19.1.5.1 Samples shall be mixed in the container they came in, taking care to not spill any sample prior to subsampling.

5.19.1.5.2 Two sub-samples shall be weighed out for extraction and extracted as separate samples.

5.19.1.5.3 Each extract shall be analyzed as an individual sample

5.19.2 Reporting PT Results

5.19.2.1 AOAC and FAPAS lists of potentially spiked pesticides are available from the provider websites. Rounds issued by CDFA are designed to focus only on those compounds validated by the applicable laboratory(ies). For all rounds, participants shall only be evaluated for those residues validated by their laboratory and not declared as Marginal Performing Analytes. The report provided will clearly identify these pesticides. Reporting of the Marginal Performing Analytes shall be optional.

5.19.2.2 For AOAC and FAPAS, it is recognized that a laboratory may not have validated the commodity scheduled for that specific round. Standards used in routine analyses of assigned commodities should be used. Efforts will be made to provide a matrix blank for each round.

5.19.2.3 Report results according to provider instructions and requirements. Reporting to USDA/AMS via RDE is optional.

5.19.2.4 For FAPAS, LOD/LOQ and recovery values reported may be values obtained from previous routine batches of the laboratory's usual commodity(ies).

5.19.2.5 Reports for each round shall be posted to the PDP Extranet within 10 working days of receipt by USDA/AMS.

5.19.3 Laboratory Response

5.19.3.1 Upon receipt of PDP PT results, laboratories shall review results and initiate corrective actions when they are considered unacceptable by the PT scheme provider.

5.19.3.2 Where AOAC is the provider, z-scores whose absolute values are greater than or equal to 3 are unsatisfactory. Where FAPAS is the provider, z-scores whose absolute values are greater than 3 are unsatisfactory.

Note: *AOAC's target value is the spiked value and the target standard deviation is assigned at 20% of the target concentration. FAPAS' assigned/target value is the*

consensus value of the submitted results (with appropriate exclusions as noted in the FAPAS reports) and the target standard deviation is determined based on Horwitz.

5.19.3.3 For rounds provided by CDFA, unacceptable results shall be defined as those outside 50-150% recovery, or outside the statistically calculated range defined as ± 3xSD of the mean of last 20 data points of the laboratory's spike recovery for the compound, or outside a range agreed upon with USDA/AMS. Unvalidated or Marginal Performing Analytes need not meet these criteria, but should be addressed in the PT section of the semi-annual QA report.

5.19.3.4 If any corrective actions are initiated due to the results, USDA/AMS shall be informed within 30 days. Refer to SOP PDP-ADMIN for notification details.

5.20 Measurement Uncertainty

Measurement uncertainty shall be determined on an annual (calendar year) basis by USDA/AMS. USDA/AMS will calculate each year's value using 2x the standard deviation of program recovery data reported with each analytical data set. For example, during calendar year 2003, the mean program matrix spike recovery was 92% and the standard deviation was 26%. Results for 2003 would be expressed as "value ± 52%." USDA/AMS will be responsible for communicating program measurement uncertainty values to data users.

USDA/AMS does not require individual PDP laboratories to report their measurement uncertainty along with sample results.

United States Department of Agriculture
Agricultural Marketing Service, Science & Technology
Pesticide Data Program

SOP No.: PDP-QC		Page 38 of 41
Title: Chemical Compounds, PDP Commodity Grouping, Method Validation and Quality Control		
Revision: 5	Replaces: 10/01/2013	Effective: 10/01/2014

Chris Pappas 9/30/14

Revised By: Chris Pappas Date
Monitoring Programs Division
1400 Independence Ave, SW
Washington, DC 20250
(202) 572-8173

Dannis Tamplin 9/30/2014

Reviewed By: Dannis Tamplin Date
Presiding Member of PDP Technical Advisory Group
Texas Department of Agriculture – Pesticide Laboratory
1500 Research Parkway, Suite B100
College Station, TX 77845
(979) 458-4213

Diana Haynes 9/30/14

Approved By: Diana Haynes Date
PDP Technical Director
Monitoring Programs Division
1400 Independence Ave, SW
Washington, DC 20250
(202) 572-8167

Diana Haynes 9/30/14

Approved By: Diana Haynes Date
Acting PDP Program Administrative Director
Monitoring Programs Division
1400 Independence Ave, SW
Washington, DC 20250
(202) 572-8167

ORIGINAL SIGNATURE PAGE MAINTAINED BY USDA, AMS, SCIENCE & TECHNOLOGY, MONITORING PROGRAMS DIVISION
ELECTRONICALLY REPRODUCED SIGNATURE

Revision 5 August 2014 Monitoring Programs Division

- Updated references to USDA/AMS throughout document
- Updated prioritization protocols in sections 5.1.2.1, 5.1.2.2.2, 5.1.2.2.3, and 5.1.2.2.4
- Changed standard checking requirement to 15% RPD in sections 5.2.6, 5.2.6.2, 5.2.7.2.1, and 5.2.7.2.2
- Combined laboratory Letter of Intent requirements into section 5.15.3
- Updated USDA/AMS address in section 5.15.4
- Updated USDA/AMS Letter of Intent procedures in section 5.16.1

Revision 4 July 2013 Monitoring Programs Division

- Updated references to USDA/AMS throughout document
- Added commodity codes for avocado, catfish, dairy-based infant formula, raspberries, salmon, and soy-based infant formula to section 5.9
- Added procedures for subsampling PT samples to section 5.19.1.5
- Updated Attachment 2 by adding the following compounds: acrinathrin, AMPA, aviglycine HCl, bromopropylate, bupirimate, butocarboxim, butocarboxim sulfone, butocarboxim sulfoxide, chlorsulfuron, chlozolinate, clethodim 5 hydroxy sulfone, clethodim sulfone, clethodim sulfoxide, clofencet, crotoxyphos, crufomate, demeton-S, demeton-S sulfone, dichlofluanid, DMST,fenbutatin oxide, fenchlorphos, fenpropimorph, fensulfothion, fenthion o-analog, fipronil sulfone, fluquinconazole, flusilazole, flutriafol, fluxapyroxad, glyphosate, haloxyfop, iodosulfuron methyl, lenacil, lufenuron, mesosulfuron methyl, metaflumizole, methiocarb sulfone, methiocarb sulfoxide, oxytetracyline, paclobutrazol, penconazole, pencyuron, penthiopyrad, phoxim, pirimicarb desmethyl, primisulfuron, propaquizafop, prosulfuron, prothiofos, pyrazaophos, quizalofop ethyl, sethoxydim sulfoxide, spiroxamine, sulfosulfuron, tebufenpyrad, teflubenzuron, terbuthylazine, thifensulfuron methyl, thymol, toxaphene, and tribenuron methyl
- Updated Attachments 3 and 4 for the following commodities: avocado, catfish, infant formula (dairy-based and soy based), raspberries, and salmon

Revision 3 March 2012 Monitoring Programs Division

- Updated prioritization rationale in section 5.1.2
- Added exemption for CoA and current expiration date for revoked compounds to section 5.2.1.2
- Defined extraction/detection system in section 5.4.3
- Clarified process control compound requirements in section 5.8
- Combined PDP Commodity Groupings in section 5.9

- Added guidance for LOD establishment for zero noise instruments in section 5.10.2.2
- Changed multi-peak compound LOD requirements in section 5.10.2.5
- Changed LOD verification requirements in section 5.11.4
- Specified PT samples larger than routine analytical samples may be run in duplicate in section 5.19.1.5
- Clarified what constitutes unacceptable PT scores in section 5.19.3.2
- Updated Attachment 2 by adding the following compounds: 2,4-DMPF, DEET, Dialofos, Dioxathion, Endothall, Indaziflam, Leptophos o-analog, Metconazole, Quinalphos, Saflufencil, Triazophos

Revision 2 July 2011 Monitoring Programs Division

- Updated the entire SOP with the new program's name Monitoring Programs Division or MP instead of MPO
- Updated the Reference list.
- Removed the word "**Note"** in sections 5.2.1.2; 5.6.2.3; 5.6.4; 5.10.2; 5.20 leaving the paragraphs as instructions
- Updated section 5.2.7 by renumbering the subsections
- Added new commodities (Baby Foods, Papaya, Tangerines, Cherry Tomatoes, Snap Peas, Canned Beets) to 5.9
- Updated sections 5.15.5.3, 5.16.2.5 about approving MPAs
- Added the E code in section 5.17.8
- Updated requirements for section 5.18.2 by eliminating subsection 5.18.2.1
- Updated sections 5.18.2.2.1, 5.18.2.2.2 about MPAs (re)designation, replacing the letter of deviation with e-mail communication
- Updated section 5.18.2.2.2 by replacing the letter of deviation requirement with an e-mail communication
- Updated sections 5.19.1 and 5.19.2, by replacing "Ultra/GLEC" with "Ultra"
- Updated section 5.19.3.1 with new FAPAS requirements regarding z-scores
- In section 5.19.1.3 replaced "collected by GLEC" with "provided by MP"
- Updated Attachment 2 by adding a Group 4, Benzothiazoles/triazolones, to 'PDP Compound Groups for Fruit and Vegetables' list
- Updated Attachment 2 by adding the following compounds: Fosthiazate, Iprovalicarb, Rimsulfuron, Trifloxysulfuron, Uniconazole to PDP Pesticides Codes list
- Updated Attachment 3, 4 with new commodities: Baby Foods, Papaya, Tangerines, Cherry Tomatoes, Snap Peas, Canned Beets

Revision 1 July 2010 Monitoring Programs Office

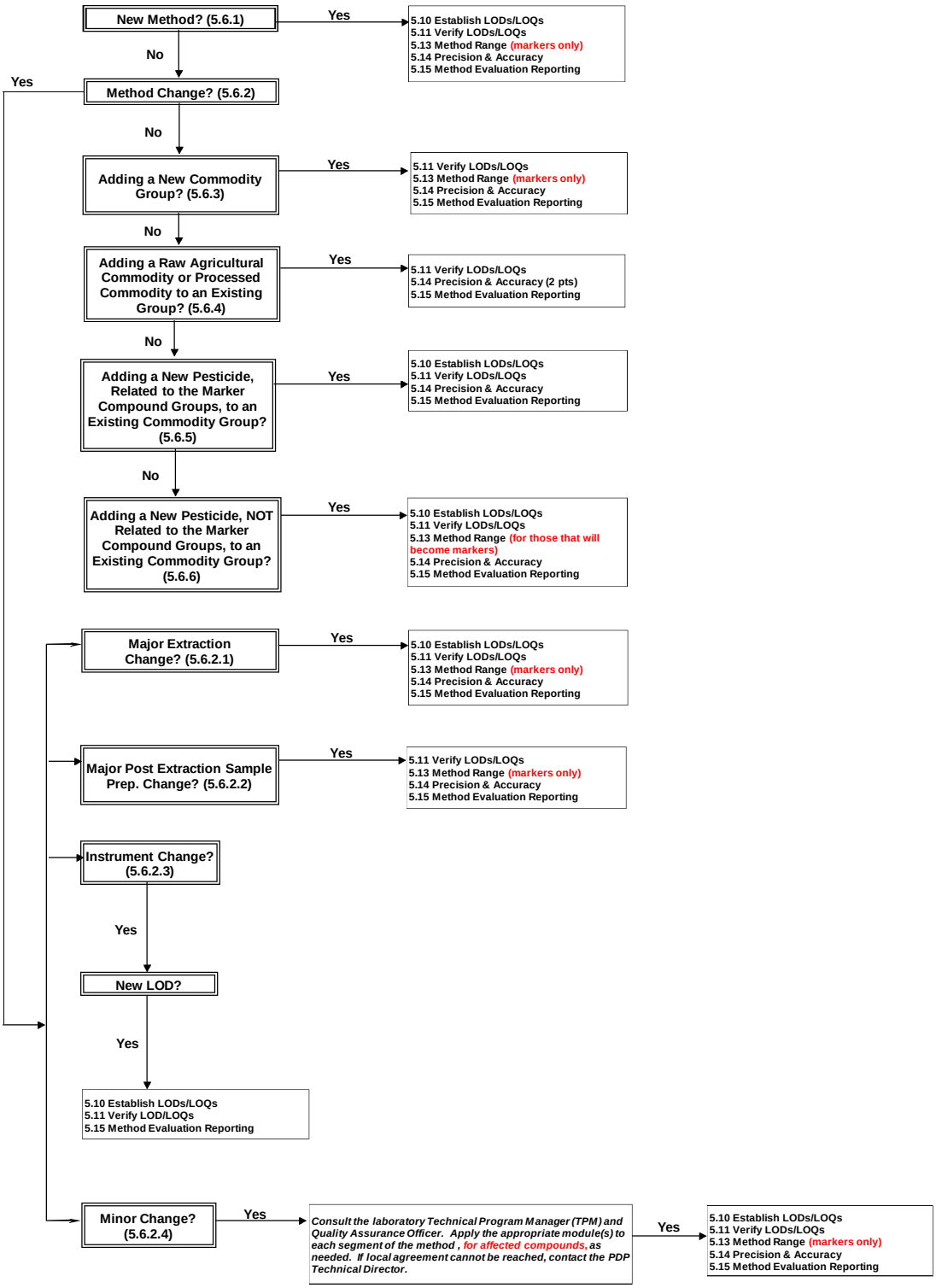
- Renumbered the entire SOP replacing the sections' letters with numbers.

United States Department of Agriculture
Agricultural Marketing Service, Science & Technology
Pesticide Data Program

SOP No.: PDP-QC		Page 41 of 41
Title: Chemical Compounds, PDP Commodity Grouping, Method Validation and Quality Control		
Revision: 5	Replaces: 10/01/2013	Effective: 10/01/2014

- Redefined Priority 1-4 compounds.
- Updared section 5.2.8 for Working Dilutions/Mixed Standards.
- Changed and updated section 5.5 Method Validation Evaluation Guidelines.
- Changed and updated section 5.6 Method Validation Scenarios.
- Updated section 5.7 Marker Pesticides to remove mandatory markers.
- Updated section 5.9 PDP Commodity Groupings.
- Removed section 5.12 LOD Check.
- Added section 5.13.6 Method Range Extension.
- Updated section 5.15.3 as part of Method Evaluation Reporting.
- Removed section 5.16.e.4
- Removed section 5.18.d.1.b
- Updated section 5.19.c (now 5.18.2) Matrix Spike Criteria.
- Updated section 5.19.e (now 5.18.3) Response to Failure To Meet Matrix Spike Criteria Range.
- Updated section 5.19.d (now 5.18.5) Response to Failure To Meet Chosen Process Control Criteria Range.
- Updated Attachment 1.
- Updated Attachment 2, by adding the following new compounds: Avermectin B_1, Bensulide oxygen analog, Cyhalofop butyl, Dimethipin, Disulfoton oxygen analog, Disulfoton oxygen analog sulfone, Disulfoton oxygen analog sulfoxide, Eprinomectin, Fenobucarb (BPMC), Flubendiamine, Flufenoxuron, Fluopicolide, Imidacloprid urea, Mandipropamid, Metaldehyde, Milbemectin, Pinoxaden, Promecarb, Prothioconazole, Pyrasulfotole, Pyridalyl, Tepraloxydim.
- Updated Attachments 3, 4 and 5.

Method Evaluation Flowchart



PDP Compound Groups for Fruit and Vegetables

Group	Description
1	Phthalimides, conazoles and metabolites, carbamaldehydes, phenyl pyrroles, methoxy-acetamides, and neonicotinyls
2	Cyano/nitrile group(s) attached to double bond
3	Halogenated aromatics and chlorinated cyclics/cyclodienes
4	Benzothiazoles/triazolones
7	Dinitroanilines
8	Pyrethroids and metabolites and synergists
9	Triazines
11	Organophosphates and metabolites
14	Carbamates, thiocarbamates and metabolites
16	Uracils/ureas, imidazolinones, diacylhydrazines, and sulfonyl ureas
17	Nitrogenous heterocyclics
20	Phenoxy acids, ethanesulfonic acids (ESA), and oxanilic acids(OA)
21	Oxyhydrocarbons
22	Strobilurins
27	Tetronic acids
28	Cyclohexenone oxime
29	Macrocyclic lactones
99	Single

Note: Missing group numbers are attributed to the consolidation of groups. For example, Group 15, Thiocarbamates, was consolidated into Group 14, Carbamates.

PDP Pesticide Codes and Multi-residue Compound Groupings for Fruit and Vegetables

Compound Name	Molecular Formula	Chemical Family	Group	Pesticide Code
1-naphthol	$C_{10}H_8O$	carbamate metabolite	14	382
1,2,4-triazole	$C_2H_3N_3$	triazole metabolite	1	A68
2,4-DB	$C_{10}H_{10}Cl_2O_3$	phenoxy acid	20	317
2,4-D	$C_8H_6Cl_2O_3$	phenoxy acid	20	026
2,4-dimethylphenyl formamide (DMPF)	$C_9H_{11}NO$	amidine	2	AGR
2,4,5-T	$C_8H_5Cl_3O_3$	phenoxy acid	20	312
3-hydroxycarbofuran	$C_{12}H_{15}NO_4$	carbamate metabolite	14	512
4-dimethylaminosulphotoluidide (DMST); tolylfluanid metabolite	$C_9H_{14}N_2O_2S$	phenylsulfamidemetabolite	1	AJU
5-hydroxythiabendazole	$C_{10}H_8N_3OS$	carbamate	1	B28
Abamectin	$C_{48}H_{72}O_{14} + C_{47}H_{70}O_{14}$	avermectin (macrocyclic lactone)	29	948
Acephate	$C_4H_{10}NO_3PS$	phosphoramidothioic acid	11	204
Acetamiprid	$C_{10}H_{11}ClN_4$	neonicotinyls	1	B80
Acetochlor	$C_{14}H_{20}ClNO_2$	chloroacetanilide	1	807
Acetochlor ethanesulfonic acid	$C_8H_{21}NO_5S$	chloroacetanilide metabolite	20	ABN
Acetochlor oxanilic acid	$C_{14}H_{19}NO_4$	chloroacetanilide metabolite	20	ABO
Acibenzolar-S-methyl	$C_8H_6N_2OS_2$	thiadiazole	1	B51
Acifluorfen	$C_{14}H_{21}NO_5S$	diphenyl ether	3	727
Acrinathrin	$C_{26}H_{21}F_6NO_5$	pyrethroid	8	A03
Alachlor	$C_{14}H_{20}ClNO_2$	acetamide	1	227
Alachlor ethanesulfonic acid	$C_8H_{21}NO_5S$	chloroacetanilide metabolite	20	ABP
Alachlor oxanilic acid	$C_{14}H_{19}NO_4$	chloroacetanilide metabolite	20	ABQ
Aldicarb	$C_7H_{14}N_2O_2S$	carbamate	14	167
Aldicarb sulfone	$C_7H_{14}N_2O_4S$	carbamate	14	168
Aldicarb sulfoxide	$C_7H_{14}N_2O_3S$	carbamate	14	169
Aldrin	$C_{12}H_8Cl_6$	cyclodiene	3	001
Allethrin	$C_{19}H_{26}O_3$	pyrethroid	8	002
Ametryn	$C_9H_{17}N_5S$	triazine	9	156
Aminomethylphosphonic acid (AMPA)	CH_6NO_3P	organophosphate metabolite	99	957
Amitraz	$C_{19}H_{23}N_3$	amidine	2	233

PDP Pesticide Codes and Multi-residue Compound Groupings for Fruit and Vegetables

Compound Name	Molecular Formula	Chemical Family	Group	Pesticide Code
Anilazine	$C_9H_5Cl_3N_4$	triazine	9	033
Atrazine	$C_8H_{14}ClN_5$	triazine	9	305
Avermectin B_1	$C_{48}H_{72}O_{14}$ (avermectin B_{1a}) + $C_{47}H_{70}O_{14}$ (avermectin B_{1b})	macrocyclic lactone	29	AHQ
Aviglycine HCl	$C_6H_{12}N_2O_3$	ethylene inhibitors	99	AKT
Azinphos ethyl	$C_{12}H_{16}N_3O_3PS_2$	organophosphate	11	547
Azinphos methyl	$C_{10}H_{12}N_3O_3PS_2$	benzotriazine	11	042
Azinphos methyl O-analog	$C_{10}H_{12}N_3O_4PS$	oxon	11	769
Azoxystrobin	$C_{22}H_{17}N_3O_5$	strobilurin	22	B48
Bendiocarb	$C_{11}H_{13}NO_4$	carbamate	14	658
Benfluralin	$C_{13}H_{16}F_3N_3O_4$	dinitroaniline	7	191
Benomyl	$C_{14}H_{18}N_4O_3$	benzimidazole	14	192
Benoxacor	$C_{11}H_{11}Cl_2NO_2$	benzoxazine	1	A05
Bensulfuron methyl	$C_{16}H_{18}N_4O_7S$	sulfonyl urea	16	ABR
Bensulide	$C_{14}H_{24}NO_4PS_3$	organophosphate	11	239
Bensulide oxygen analog	$C_{14}H_{24}NO_4PS_3$	organophosphate	11	740
Bentazon	$C_{10}H_{12}N_2O_3S$	thiadiazinone dioxide	17	758
Benthiavalicarb-isopropyl	$C_{15}H_{18}FN_3O_3S$	benzothiazole	4	AGP
BHC alpha	$C_6H_6Cl_6$	hexane ring	3	903
BHC beta	$C_6H_6Cl_6$	hexane ring	3	904
Bifenazate	$C_{17}H_{20}N_2O_3$	hydrazine carboxylate	14	B82
Bifenthrin	$C_{23}H_{22}ClF_3O_2$	pyrethroid	8	930
Bitertanol	$C_{20}H_{23}N_3O_2$	triazole	1	850
Boscalid	$C_{18}H_{12}Cl_2N_2O$	anilide/pyridine	1	B75
Bromacil	$C_9H_{13}BrN_2O_2$	uracil	16	153
Bromopropylate	$C_{17}H_{16}Br_2O_3$	bridged diphenyl	3	523
Bromoxynil	$C_7H_3Br_2NO$	phenol	20	729
Bromuconazole-46	$C_{13}H_{12}BrCl_2N_3O$	conazole	1	ADU
Bromuconazole-47	$C_{13}H_{12}BrCl_2N_3O$	conazole	1	ADV

PDP Pesticide Codes and Multi-residue Compound Groupings for Fruit and Vegetables

Compound Name	Molecular Formula	Chemical Family	Group	Pesticide Code
Bupirimate	$C_{13}H_{24}N_4O_3S$	pyrimidine	17 or 3	872
Buprofezin	$C_{16}H_{23}N_3OS$	thiadiazinone	17	B52
Butachlor	$C_{17}H_{26}ClNO_2$	chloroacetanilide	1	806
Butocarboxim	$C_7H_{14}N_2O_2S$	oxime carbamate	14	857
Butocarboxim sulfone	$C_7H_{14}N_2O_4S$	oxime carbamate metabolite	14	AKN
Butocarboxim sulfoxide	$C_7H_{14}N_2O_3S$	oxime carbamate metabolite	14	AKO
Butylate	$C_{11}H_{23}NOS$	thiocarbamate	14	783
Cadusafos	$C_{10}HOPS_2$	phosphorodithionate	11	953
Captafol	$C_{10}H_9Cl_4NO_2S$	phthalimide	1	174
Captan	$C_9H_8Cl_3NO_2S$	phthalimide	1	011
Carbaryl	$C_{12}H_{11}NO_2$	carbamate	14	102
Carbendazim	$C_9H_9N_3O_2$	benzimidazole	14	666
Carbofuran	$C_{12}H_{15}NO_3$	carbamate	14	180
Carbophenothion	$C_{11}H_{16}ClO_2PS_3$	organophosphate	11	202
Carboxin	$C_{12}H_{13}NO_2S$	carboxamide	1	210
Carfentrazone ethyl	$C_{15}H_{14}Cl_2F_3N_3O_3$	fluorophenyl triazole	4	B21
Chloramben	$C_7H_5Cl_2NO_2$	benzoic acid	20	952
Chlorantraniliprole	$C_{18}H_{14}BrCl_2N_5O_2$	diamide; pyrazole	1	AGW
Chlordane cis	$C_{10}H_6Cl_8$	cyclodiene	3	173
Chlordane trans	$C_{10}H_6Cl_8$	cyclodiene	3	172
Chlorethoxyfos	$C_6H_{11}Cl_4O_3PS$	phosphorothioate	11	A15
Chlorfenapyr	$C_{15}H_{11}BrClF_3N_2O$	pyrrole	1	B13
Chlorfenvinphos total	$C_{12}H_{14}Cl_3O_4P$	organophosphate	11	AAK
Chlorimuron ethyl	$C_{15}H_{15}ClN_4O_6S$	sulfonyl urea	16	717
Chloroneb	$C_8H_8Cl_2O_2$	chlorobenzene	3	196
Chlorothalonil	$C_8Cl_4N_2$	phthalimide	2	164
Chlorpropham	$C_{10}H_{12}ClNO_2$	carbamate	14	114
Chlorpyrifos	$C_9H_{11}Cl_3NO_3PS$	phosphorothionic acid	11	160
Chlorpyrifos methyl	$C_7H_7Cl_3NO_3PS$	phosphorothionic	11	235

PDP Pesticide Codes and Multi-residue Compound Groupings for Fruit and Vegetables

Compound Name	Molecular Formula	Chemical Family	Group	Pesticide Code
Chlorpyrifos O-analog	$C_9H_{11}Cl_3NO_4P$	oxon	11	772
Chlorsulfuron	$C_{12}H_{12}ClN_5O_4S$	triazinylsulfonyl urea	16	718
Chlozolinate	$C_{13}H_{11}Cl_2NO_5$	dichlorophenyl dicarboxamide; oxazole	1	AJS
Clethodim	$C_{17}H_{26}ClNO_3S$	cyclohexene oxime	28	AER
Clethodim 5-hydroxy sulfone	$C_{17}H_{26}ClNO_6S$	cyclohexene oxime metabolite	28	AJM
Clethodim sulfone	$C_{17}H_{26}ClNO_5S$	cyclohexene oxime metabolite	28	AJN
Clethodim sulfoxide	$C_{17}H_{26}ClNO_4S$	cyclohexene oxime metabolite	28	AJO
Clodinafop propargyl	$C_{17}H_{13}ClFNO_4$	aryloxyphenoxypropionic acid	20	B38
Clofencet	$C_{13}H_{11}ClN_2O_3$	unclassified	99	AET
Clofentezine	$C_{14}H_8Cl_2N_4$	tetrazine	99	699
Clomazone	$C_{12}H_{14}ClNO_2$	pyridazone	17	719
Clopyralid	$C_6H_3Cl_2NO_2$	pyridinecarboxylic acid	20	B46
Clothianidin	$C_6H_8ClN_5O_2S$	neonicotinyl	1	AEP
Coumaphos	$C_{14}H_{16}ClO_5PS$	phosphorothioate	11	124
Coumaphos O-analog	$C_{14}H_{16}ClO_6P$	oxon	11	614
Crotoxyphos	$C_{14}H_{19}O_6P$	organophosphate	11	267
Crufomate	$C_{12}H_{19}ClNO_3P$	phosphoramidate	11	667
Cyanazine	$C_9H_{13}ClN_6$	triazine	9	228
Cyazofamid	$C_{13}H_{13}ClN_4O_2S$	imidazole	1	AGA
Cycloate	$C_{11}H_{21}NOS$	thiocarbamate	14	232
Cyfluthrin	$C_{22}H_{18}Cl_2FNO_3$	pyrethroid	8	781
Cyhalofop butyl	$C_{20}H_{20}FNO_4$	aryloxyphenoxypropionic herbicide	17	B59
Cyhalothrin (lambda)	$C_{23}H_{19}ClF_3NO_3$	pyrethroid	8	AEM
Cyhalothrin (lambda epimer R157836)	$C_{23}H_{19}ClF_3NO_3$	pyrethroid	8	AEN
Cyhalothrin total (L-cyhalothrin + R157836 epimer)	$C_{23}H_{19}ClF_3NO_3$	pyrethroid	8	AEL
Cymoxanil	$C_7H_{10}N_4O_3$	cyanoacetamide	2	877
Cypermethrin	$C_{22}H_{19}Cl_2NO_3$	pyrethroid	8	597
Cyphenothrin	$C_{24}H_{25}NO_3$	pyrethroid	8	ADH

PDP Pesticide Codes and Multi-residue Compound Groupings for Fruit and Vegetables

Compound Name	Molecular Formula	Chemical Family	Group	Pesticide Code
Cyproconazole	$C_{15}H_{18}ClN_3O$	conazole	1	A22
Cyprodinil	$C_{14}H_{15}N_3$	anilinopyrimidine	17	B22
Cyromazine	$C_6H_{10}N_6$	triazine	9	255
DCPA	$C_{10}H_6Cl_4O_4$	phthalic acid	3	134
DCPA mono acid	$C_9H_4Cl_4O_4$	dicarboxylic acid	20	ABV
DDD o,p'	$C_{14}H_{10}Cl_4$	bridged biphenyl	3	909
DDD p,p'	$C_{14}H_{10}Cl_4$	bridged biphenyl	3	908
DDE o,p'	$C_{14}H_8Cl_4$	bridged biphenyl	3	911
DDE p,p'	$C_{14}H_8Cl_4$	bridged biphenyl	3	910
DDT o,p'	$C_{14}H_9Cl_5$	bridged biphenyl	3	907
DDT p,p'	$C_{14}H_9Cl_5$	bridged biphenyl	3	906
DEET (N,N-diethyl-m-toluamide)	$C_{12}H_{17}NO$	amide	2	PBS
DEF (Tribufos)	$C_{12}H_{27}OPS_3$	organophosphate	11	217
Deltamethrin (includes parent Tralomethrin)	$C_{22}H_{19}Br_2NO_3$	pyrethroid	8	612
Demeton	$C_8H_{19}O_3PS_2$	phosphorothioate	11	023
Demeton-S	$C_8H_{19}O_3PS_2$	organothiophosphate	11	558
Demeton-S sulfone	$C_8H_{19}O_5PS_2$	organothiophosphate metabolite	11	226
Desethyl atrazine	$C_6H_{10}ClN_5$	triazine metabolite	9	964
Desethyl-desisopropyl atrazine	$C_3H_4ClN_5$	triazine metabolite	9	784
Desisopropyl atrazine	$C_5H_8ClN_5$	triazine metabolite	9	785
Desmedipham	$C_{16}H_{16}N_2O_4$	carbamate	14	786
Dialifos	$C_{14}H_{17}ClNO_4PS_2$	organothiophosphate	11	244
Diazinon	$C_{12}H_{21}N_2O_3PS$	phosphorothioate	11	024
Diazinon O-analog	$C_{12}H_{21}N_2O_4P$	oxon	11	395
Dicamba	$C_8H_6Cl_2O_3$	benzoic acid	20	155
Dichlobenil	$C_7H_3Cl_2N$	nitrile	2	324
Dichlofluanid	$C_9H_{11}Cl_2FN_2O_2S_2$	phenylsulfamide	1	588
Dichlorprop	$C_9H_8Cl_2O_3$	phenoxy acid	20	A25
Dichlorvos (DDVP)	$C_4H_7Cl_2O_4P$	phosphoric acid	11	338

PDP Pesticide Codes and Multi-residue Compound Groupings for Fruit and Vegetables

Compound Name	Molecular Formula	Chemical Family	Group	Pesticide Code
Diclofop methyl	$C_{16}H_{14}Cl_2O_4$	aryloxyphenoxypropionic acid	20	299
Dicloran	$C_6H_4Cl_2N_2O_2$	nitroaniline	7	144
Dicofol o,p'	$C_{14}H_9Cl_5O$	bridged biphenyl	3	253
Dicofol p,p'	$C_{14}H_9Cl_5O$	bridged biphenyl	3	254
Dicrotophos	$C_8H_{16}NO_5P$	organophosphate	11	209
Dieldrin	$C_{12}H_8Cl_6O$	cyclodiene	3	028
Difenoconazole	$C_{19}H_{17}Cl_2N_3O_3$	triazole	1	B58
Diflubenzuron	$C_{14}H_9ClF_2N_2O_2$	urea	16	651
Diflufenzopyr	$C_{15}H_{12}F_2N_4O_3$	urea	16	AFY
Dimethenamid	$C_{12}H_{18}ClNO_2S$	acetamide	1	ADD
Dimethenamid ethanesulfonic acid	$C_{12}H_{19}NO_5S_2$	acetamide metabolite	20	AEX
Dimethenamid oxanilic acid	$C_{12}H_{17}NO_4S$	acetamide metabolite	20	AEY
Dimethenamid P	$C_{12}H_{18}ClNO_2S$	amide	1	AEB
Dimethipin	$C_6H_{10}O_4S_2$	urea	16	787
Dimethoate	$C_5H_{12}NO_3PS_2$	phosphorodithionic acid	11	171
Dimethomorph	$C_{21}H_{22}ClNO_4$	chlorophenyl morpholine	3	B77
Dinoseb	$C_{10}H_{12}N_2O_5$	phenol	20	031
Dinotefuran	$C_7H_{14}N_4O_3$	neonicotinyl	1	AFO
Dioxathion	$C_{12}H_{26}O_6P_2S_4$	organothiophosphate	11	103
Diphenamid	$C_{16}H_{17}NO$	acetamide	1	330
Diphenylamine (DPA)	$C_{12}H_{11}N$	amine	3	125
Disulfoton	$C_8H_{19}O_2PS_3$	phosphorodithioate	11	117
Disulfoton oxygen analog	$C_8H_{19}O_3PS_2$	organophosphate	11	AHN
Disulfoton oxygen analog sulfone	$C_6H_{15}O_5PS_2$	organophosphate	11	AHV
Disulfoton oxygen analog sulfoxide	$C_6H_{15}O_4PS_2$	organophosphate	11	AHW
Disulfoton sulfone	$C_8H_{19}O_4PS$	sulfone	11	216
Disulfoton sulfoxide	$C_8H_{19}O_3PS_3$	sulfoxide	11	706
Dithianon	$C_{14}H_4N_2O_2S_2$	quinine	17	AHO
Diuron	$C_9H_{10}Cl_2N_2O$	urea	16	032

PDP Pesticide Codes and Multi-residue Compound Groupings for Fruit and Vegetables

Compound Name	Molecular Formula	Chemical Family	Group	Pesticide Code
Dodine	$C_{15}H_{33}N_3O_2$	aliphatic nitrogenous fungicide	2	104
Emamectin benzoate	$C_{49}H_{75}NO_{13} + C_{48}H_{73}NO_{13}$	avermectin (macrocyclic lactone)	29	AGH
Endosulfan I	$C_9H_6Cl_6O_3S$	cyclodiene	3	900
Endosulfan II	$C_9H_6Cl_6O_3S$	cyclodiene	3	901
Endosulfan sulfate	$C_9H_6Cl_6O_4S$	cyclodiene	3	902
Endrin	$C_{12}H_8Cl_6O$	cyclodiene	3	034
Endothall	$C_8H_{10}O_5$	dicarboxylic acid	21	AKV
Epoxiconazole	$C_{17}H_{13}ClFN_3O$	conazole	1	B53
Eprinomectin	$C_{50}H_{75}NO_{14}$ (eprinomectin B_{1a}) + $C_{49}H_{73}NO_{14}$ (eprinomectin B_{1b})	macrocyclic lactone	29	AHR
EPTC	$C_9H_{19}NOS$	thiocarbamate	14	200
Esfenvalerate	$C_{25}H_{22}ClNO_3$	pyrethroid	8	714
Ethalfluralin	$C_{13}H_{14}F_3N_3O_4$	dinitroaniline	7	721
Ethiofencarb	$C_{11}H_{15}NO_2S$	carbamate	14	858
Ethion	$C_9H_{22}O_4P_2S_4$	phosphorodithioic acid	11	107
Ethion di oxon	$C_9H_{22}O_6P_2S_2$	oxon	11	538
Ethion mono oxon	$C_9H_{22}O_5P_2S_3$	oxon	11	AAX
Ethofumesate	$C_{13}H_{18}O_5S$	benzofuranyl alkylsulfonate	11	945
Ethoprop	$C_8H_{19}O_2PS_2$	dipropyl phosphorodithioate	11	175
Ethoxyquin	$C_{14}H_{19}NO$	quinoline	99	111
Etoxazole	$C_{21}H_{23}F_2NO_2$	oxazole	1	B84
Etridiazole	$C_5H_5Cl_3N_2OS$	thiadiazole	1	722
Famoxadone	$C_{22}H_{18}N_2O_4$	dicarboximide/oxazole	1	AEW
Fenamidone	$C_{17}H_{17}N_3OS$	imidazole	1	B64
Fenamiphos	$C_{13}H_{22}NO_3PS$	phosphoramidate	11	236
Fenamiphos sulfone	$C_{13}H_{22}NO_5PS$	sulfone	11	745
Fenamiphos sulfoxide	$C_{13}H_{22}NO_4PS$	sulfoxide	11	746
Fenarimol	$C_{17}H_{12}Cl_2N_2O$	pyrimidine	3	271
Fenazaquin	$C_{20}H_{22}N_2O$	unclassified acaricide	27	B73

PDP Pesticide Codes and Multi-residue Compound Groupings for Fruit and Vegetables

Compound Name	Molecular Formula	Chemical Family	Group	Pesticide Code
Fenbuconazole	$C_{19}H_{17}ClN_4$	conazole	1	A30
Fenbutatin oxide	$C_{60}H_{28}OSn_2$	organotin acaride	99	639
Fenchlorphos (ronnel)	$C_8H_8Cl_3O_3PS$	phenyl organothiophosphate	11	105
Fenhexamid	$C_{14}H_{17}Cl_2NO_2$	chlorocarboximide	1	B41
Fenitrothion	$C_9H_{12}NO_5PS$	phosphorothioate	11	391
Fenitrothion O-analog	$C_9H_{12}NO_6P$	oxon	11	648
Fenobucarb (BPMC)	$C_{12}H_{17}NO_2$	phenyl methylcarbamate	14	856
Fenoxaprop ethyl	$C_{18}H_{16}ClNO_5$	aryloxyphenoxypropionic acid	20	777
Fenpropathrin	$C_{22}H_{23}NO_3$	pyrethroid	8	808
Fenpropimorph	$C_{20}H_{33}NO$	morpholine	3	886
Fenpyroximate	$C_{24}H_{27}N_3O_4$	phenoxypyrazol	1	AFS
Fensulfothion	$C_{11}H_{17}O_4PS_2$	phenyl organothiophosphate	11	243
Fenthion	$C_{10}H_{15}O_3PS_2$	phosphorothioate	11	177
Fenthion O-analog	$C_{10}H_{15}O_4PS$	oxon	11	691
Fenuron	$C_9H_{12}N_2O$	urea	16	840
Fenvalerate	$C_{25}H_{22}ClNO_3$	pyrethroid	8	546
Fipronil	$C_{12}H_4C_{l2}F_6N_4OS$	phenyl pyrazole	1	A82
Fipronil sulfone	$C_{12}H_4Cl_2F_6N_4O_2S$	phenylpyrazole	1	A84
Flonicamid	$C_9H_6F_3N_3O$	nicotinoid	1	AGG
Fluazifop butyl	$C_{15}H_{12}F_3NO_4$	pyridine	17	292
Fluazinam	$C_{13}H_4C_{l2}F_6N_4O_4$	pyridine	17	B54
Flubendiamide	$C_{23}H_{22}F_7IN_2O_4S$	diamide	17 or 1	AHS
Fludioxonil	$C_{12}H_6F_2N_2O_2$	phenyl pyrrole	1	B23
Flufenacet	$C_{14}H_{13}F_4N_3O_2S$	anilide	1	B30
Flufenacet ethanesulfonic acid	$C_{11}H_{14}FNO_4S$	anilide metabolite	20	AFH
Flufenacet oxanilic acid	$C_{11}H_{12}FNO_3$	anilide metabolite	20	AEZ
Flufenoxuron	$C_{21}H_{11}ClF_6N_2O_3$	urea	16	AHG
Flumetsulam	$C_{12}H_9F_2N_5O_2S$	pyrimidine	1	AAU
Flumioxazin	$C_{19}H_{15}FN_2O_2$	N-phenylphthalimide	1	AFF

PDP Pesticide Codes and Multi-residue Compound Groupings for Fruit and Vegetables

Compound Name	Molecular Formula	Chemical Family	Group	Pesticide Code
Fluometuron	$C_{10}H_{11}F_3N_2O$	urea	16	701
Fluopicolide	$C_{14}H_8Cl_3F_3N_2O$	pyridine	17 or 1	AHT
Fluoxastrobin	$C_{21}H_{16}ClFN_4O_5$	strobilurin	22	AGJ
Fluquinconazole	$C_{16}H_8Cl_2FN_5O$	aryloxyphenoxypropionic acid	1	B78
Fluridone	$C_{19}H_{14}F_3NO$	pyridine	17	736
Fluroxapyr-1-methylheptyl ester	$C_{15}H_{22}Cl_2FN_2O_3$	pyridine	17	ADJ
Flusilazole	$C_{16}H_{15}F_2N_3Si$	conazole	1	950
Flutolanil	$C_{17}H_{16}F_3NO_2$	caboxamide	1	B63
Flutriafol	$C_{16}H_{13}F_2N_3O$	conazole	1	AFM
Fluvalinate	$C_{26}H_{22}ClF_3N_2O_3$	pyrethroid	8	297
Fluxapyroxad	$C_{18}H_{12}F_5N_3O$	anilide; pyrazole	22	AKW
Folpet	$C_9H_4Cl_3NO_2S$	phthalimide	1	126
Fonofos	$C_{10}H_{15}OPS_2$	phosphorodithioic acid	11	163
Fonofos O-analog	$C_{10}H_{15}O_2PS$	oxon	11	692
Forchlorfenuron	$C_{12}H_{10}ClN_3O$	phenyl urea	16	B32
Formetanate hydrochloride	$C_{11}H_{15}N_3O_2$	formamidine	1	723
Fosthiazate	$C_9H_{18}NO_3PS_2$	organothiophosphate	11	B09
Glyphosate	$C_3H_8NO_5P$	organophosphate	99	653
Halosulfuron	$C_{12}H_{13}ClN_6O_7S$	sulfonyl urea	16	AFK
Halosulfuron methyl	$C_{12}H_{13}ClN_6O_7S$	sulfonyl urea	16	AEH
Haloxyfop	$C_{15}H_{11}ClF_3NO_4$	aryloxyphenoxypropionic acid	20	798
Heptachlor	$C_{10}H_5Cl_7$	cyclodiene	3	044
Heptachlor epoxide	$C_{10}H_5Cl_7O$	cyclodiene	3	143
Hexachlorobenzene (HCB)	C_6Cl_6	benzene ring	3	321
Hexaconazole	$C_{14}H_{17}Cl_2N_3O$	conazole	1	954
Hexazinone	$C_{12}H_{20}N_4O_2$	triazine	9	633
Hexythiazox	$C_{17}H_{21}ClN_2O_2S$	thiazolidine carboxamide	1	B10
Hydroprene	$C_{17}H_{30}O_2$	oxyhydrocarbon	21	AEC
Hydroxy atrazine	$C_8H_{15}N_5O$	triazine metabolite	9	AED

PDP Pesticide Codes and Multi-residue Compound Groupings for Fruit and Vegetables

Compound Name	Molecular Formula	Chemical Family	Group	Pesticide Code
Imazalil	$C_{14}H_{14}Cl_2N_2O$	conazole	1	604
Imazamethabenz acid	$C_{15}H_{18}N_2O_3$	imidazolinone	16	AEE
Imazamethabenz methyl	$C_{16}H_{20}N_2O_3$	imidazolinone	16	753
Imazamox	$C_{15}H_{19}N_3O_4$	imidazolinone	16	ACA
Imazapic	$C_{14}H_{17}N_3O_3$	imidazolinone	16	ACZ
Imazapyr	$C_{13}H_{15}N_3O_3$	imidazolinone	16	ACB
Imazaquin	$C_{17}H_{17}N_3O_3$	imidazolinone	16	ACC
Imazethapyr	$C_{15}H_{19}N_3O_3$	imidazolinone	16	ACD
Imidacloprid	$C_9H_{10}ClN_5O_2$	neonicotinyl	1	967
Imidacloprid urea	$C_9H_{10}ClN_3O$	neonicotinyl metabolite	1	AHF
Imiprothrin	$C_{17}H_{22}N_2O_4$	pyrethroid	8	ADK
Indaziflam	$C_{16}H_{20}FN_5$	triazine	9	AJP
Indoxacarb	$C_{22}H_{17}ClF_3N_3O_7$	carbamate	14	ADG
Iodosulfuron methyl	$C_{14}H_{14}IN_5O_6S$	triazinylsulfonyl urea	16	AKB
Iprodione	$C_{13}H_{13}Cl_2N_3O_3$	dicarboximide	1	626
Iprodione metabolite isomer	$C_{13}H_{13}Cl_2N_3O_3$	dicarboximide	1	231
Iprovalicarb	$C_{18}H_{28}N_2O_3$	carbamates	14	AGE
Isofenphos	$C_{15}H_{24}NO_4PS$	organophosphate	11	258
Isofenphos O-analog	$C_{15}H_{24}NO_5P$	oxon	11	655
Isoxaflutole	$C_{15}H_{12}F_3NO_4S$	cyclopropylisoxazole	17	B15
Kresoxim methyl	$C_{18}H_{19}NO_4$	strobilurin	22	B42
Lactofen	$C_{19}H_{15}ClF_3NO_7$	flurodiphenyl ether	3	A38
Leptophos O-analog	$C_{13}H_{10}BrCl_2O_3P$	oxon	11	A40
Lenacil	$C_{13}H_{18}N_2O_2$	uracil	16	859
Lindane (BHC gamma)	$C_6H_6Cl_6$	hexane ring	3	050
Linuron	$C_9H_{10}Cl_2N_2O_2$	urea	16	129
Lufenuron	$C_{17}H_8Cl_2F_8N_2O_3$	benzoylphenylurea	16	AJV
Malathion	$C_{10}H_{19}O_6PS_2$	phosphorodithioate	11	052
Malathion O-analog	$C_{10}H_{19}O_7PS$	oxon	11	208

PDP Pesticide Codes and Multi-residue Compound Groupings for Fruit and Vegetables

Compound Name	Molecular Formula	Chemical Family	Group	Pesticide Code
Mandipropamid	$C_{23}H_{22}ClNO_4$	amide	1	AGX
MCPA	$C_9H_9ClO_3$	phenoxy	20	318
MCPB	$C_{11}H_{13}ClO_3$	phenoxy acid	20	620
Mecoprop (MCPP)	$C_{10}H_{11}ClO_3$	phenoxy acid	20	A42
Mepanipyrim	$C_{14}H_{13}N_3$	pyrimidine	17	AGF
Mesosulfuron methyl	$C_{17}H_{21}N_5O_9S_2$	pyrimidinylsulfonyl urea	16	AKJ
Metaflumizone	$C_{24}H_{16}F_6N_4O_2$	unclassified	1	AJW
Metalaxyl	$C_{15}H_{21}NO_4$	acylalanine	1	607
Metaldehyde	$C_8H_{16}O_4$	polyaldehyde	99	B07
Metconazole	$C_{17}H_{22}ClN_3O$	conazole	1	AHX
Methamidophos	$C_2H_8NO_2PS$	phosphoramidothioic acid	11	170
Methidathion	$C_6H_{11}N_2O_4PS_3$	phosphorodithioate	11	197
Methidathion O-analog	$C_6H_{11}N_2O_5PS_2$	oxon	11	ACE
Methiocarb	$C_{11}H_{15}NO_2S$	carbamate	14	195
Methiocarb sulfone	$C_{11}H_{15}NO_4S$	carbamate metabolilte	14	634
Methiocarb sulfoxide	$C_{11}H_{15}NO_3S$	carbamate metabolilte	14	256
Methomyl	$C_5H_{10}N_2O_2S$	carbamate	14	159
Methoprene	$C_{19}H_{34}O_3$	oxyhydrocarbon	21	ACV
Methoxychlor olefin	$C_{16}H_{14}Cl_2O_2$	bridged biphenyl	3	276
Methoxychlor p,p'	$C_{16}H_{15}Cl_3O_2$	bridged biphenyl	3	275
Methoxychlor Total	$C_{16}H_{15}Cl_3O_2$	bridged biphenyl	3	055
Methoxyfenozide	$C_{22}H_{28}N_2O_3$	diacylhydrazine	16	AES
Methyl pentachlorophenyl sulfide (MPCPS, metabolite of PCNB)	$C_7H_3Cl_5S$	benzene ring	3	388
Metolachlor	$C_{15}H_{22}ClNO_2$	acetamide	1	283
Metolachlor ethanesulfonic acid	$C_{15}H_{23}NO_5S$	chloroacetanilide metabolite	20	ACG
Metolachlor oxanilic acid	$C_{15}H_{21}NO_4$	chloroacetanilide metabolite	20	ACH
Metribuzin	$C_8H_{14}N_4OS$	triazines	9	181
Metsulfuron methyl	$C_{14}H_{15}N_5O_6S$	sulfonyl urea	16	ACI
Mevinphos E/Z	$C_7H_{13}O_6P$	butenoic acid	11	579

PDP Pesticide Codes and Multi-residue Compound Groupings for Fruit and Vegetables

Compound Name	Molecular Formula	Chemical Family	Group	Pesticide Code
MGK-264	$C_{17}H_{25}NO_2$	synergist	8	058
MGK-326 (Dipropyl isocinchomeronate)	$C_{13}H_{17}NO_4$	synergist	8	ADL
Milbemectin	$C_{31}H_{44}O_7$ (milbemycin A_3) + $C_{32}H_{46}O_7$ (milbemycin A_4)	macrocyclic lactone	29	AHP
Mirex	$C_{10}Cl_{12}$	cyclodiene	3	352
Molinate	$C_9H_{17}NO_5$	thiocarbamate	14	778
Monocrotophos	$C_7H_{14}NO_5P$	phosphoric acid	11	343
Monuron	$C_9H_{11}ClN_2O$	urea	16	046
Myclobutanil	$C_{15}H_{17}ClN_4$	triazole	1	679
Naled	$C_4H_7Br_2Cl_2O_4P$	organophosphate	11	303
Napropamide	$C_{17}H_{21}NO_2$	amide	1	594
Naptalam (Alanap)	$C_{18}H_{13}NO_3$	amide	1	B18
Neburon	$C_{12}H_{16}C_{l2}N_2O$	urea	16	061
Nicosulfuron	$C_{15}H_{18}N_6O_6S$	sulfonyl urea	16	ACM
Nitrapyrin	$C_6H_3Cl_4N$	pyridine	17	725
Norflurazon	$C_{12}H_9ClF_3N_3O$	pyridazinone	17	596
Norflurazon desmethyl	$C_{11}H_7ClF_3N_3O$	pyridazinone	17	720
Novaluron	$C_{17}H_9ClF_8N_2O_4$	benzoyl urea	16	AFX
Omethoate	$C_5H_{12}NO_4PS$	phosphorothioate	11	178
o-Phenylphenol	$C_{12}H_{10}O$	biphenyl	3	083
Oryzalin	$C_{12}H_{18}N_4O_6S$	dinitroaniline	7	737
Oxadiazon	$C_{15}H_{18}Cl_2N_2O_3$	oxadiazon	1	625
Oxadixyl	$C_{14}H_{18}N_2O_4$	oxazolidine	1	A46
Oxamyl	$C_7H_{13}N_3O_3S$	carbamate	14	537
Oxamyl oxime	$C_5H_{10}N_2O_2S$	carbamate	14	A47
Oxychlordane	$C_{10}H_4Cl_8O$	cyclodiene	3	349
Oxydemeton methyl	$C_6H_{15}O_4PS_2$	organophosphate	11	219
Oxydemeton methyl sulfone	$C_6H_{15}O_5PS_2$	phosphorothioate	11	245
Oxyfluorfen	$C_{15}H_{11}ClF_3NO_4$	diphenyl ether	3	713

PDP Pesticide Codes and Multi-residue Compound Groupings for Fruit and Vegetables

Compound Name	Molecular Formula	Chemical Family	Group	Pesticide Code
Oxytetracyline	$C_{22}H_{24}N_2O_9$	unclassified	99	
Paclobutrazol	$C_{15}H_{20}ClN_3O$	growth inhibitor	1	A48
Parathion ethyl	$C_{10}H_{14}NO_5PS$	phosphorothionic acid	11	065
Parathion ethyl O-analog	$C_{10}H_{14}NO_6P$	oxon	11	370
Parathion methyl	$C_8H_{10}NO_5PS$	phosphorothionic acid	11	057
Parathion methyl O-analog	$C_8H_{10}NO_6P$	oxon	11	779
Pebulate	$C_{10}H_{21}NOS$	thiocarbamate	14	161
Penconazole	$C_{13}H_{15}Cl_2N_3$	conazole	1	956
Pencycuron	$C_{19}H_{21}ClN_2O$	urea	16	AJX
Pendimethalin	$C_{13}H_{19}N_3O_4$	dinitroaniline	7	230
Pentachloroaniline (PCA)	$C_6H_2Cl_5N$	aniline	3	351
Pentachlorobenzene (PCB)	C_6HCl_5	benzene ring	3	387
Penthiopyrad	$C_{16}H_{20}F_3N_3OS$	pyridazinone	22	AKD
Permethrin cis	$C_{21}H_{20}Cl_2O_3$	pyrethroid	8	222
Permethrin total	$C_{21}H_{20}Cl_2O_3$	pyrethroid	8	539
Permethrin trans	$C_{21}H_{20}Cl_2O_3$	pyrethroid	8	223
Phenmedipham	$C_{16}H_{16}N_2O_4$	carbamate	14	791
Phenothrin	$C_{23}H_{26}O_3$	pyrethroid	8	848
Phenthoate	$C_{12}H_{17}O_4PS_2$	organophosphate	11	377
Phorate	$C_7H_{17}O_2PS_3$	phosphorodithionic acid	11	148
Phorate O-analog	$C_7H_{17}O_3PS_2$	oxon	11	928
Phorate sulfone	$C_7H_{17}O_4PS_3$	sulfone	11	189
Phorate sulfoxide	$C_7H_{17}O_3PS_2$	sulfoxide	11	190
Phosalone	$C_{12}H_{15}ClNO_4PS_2$	phosphorodithionic acid	11	166
Phosalone O-analog	$C_{12}H_{15}ClNO_5PS$	oxon	11	929
Phosmet	$C_{11}H_{12}NO_4PS_2$	phosphorodithionic acid	11	165
Phosmet O-analog	$C_{11}H_{12}NO_5PS$	oxon	11	237
Phosphamidon	$C_{10}H_{19}ClNO_5P$	dimethyl phosphate	11	203
Phoxim	$C_{12}H_{15}N_2O_3PS$	organothiophosphate	11	247

PDP Pesticide Codes and Multi-residue Compound Groupings for Fruit and Vegetables

Compound Name	Molecular Formula	Chemical Family	Group	Pesticide Code
Picloram	$C_6H_3Cl_3N_2O_2$	carboxylic acid	20	329
Pinoxaden	$C_{23}H_{32}N_2O_4$	phenylpyrazole	22	AHH
Piperonyl butoxide	$C_{19}H_{30}O_5$	benzodioxole	8	070
Pirimicarb	$C_{11}H_{18}N_4O_2$	carbamate	14	580
Pirimicarb desmethyl	$C_{10}H_{16}N_4O_2$	dimethylcarbamate metabolite	14	873
Pirimiphos methyl	$C_{11}H_{20}N_3O_3PS$	phosphorothioate	11	562
Prallethrin	$C_{19}H_{24}O_3$	pyrethroid	8	ADC
Primisulfuron	$C_{14}H_{10}F_4N_4O_7S$	pyrimidinylsulfonyl urea	16	AHA
Prochloraz	$C_{15}H_{16}Cl_3N_3O_2$	imidazole	9	833
Procymidone	$C_{13}H_{11}Cl_2NO_2$	dicarboximide	1	593
Profenofos	$C_{11}H_{15}BrClO_3PS$	phosphorothioate	11	224
Promecarb	$C_{12}H_{17}NO_2$	phenyl methylcarbamate	14	385
Prothioconazole	$C_{14}H_{15}Cl_2N_3OS$	conazole	1	AHJ
Prometon	$C_{10}H_{19}N_5O$	triazine	9	942
Prometryn	$C_{10}H_{19}N_5S$	triazine	9	249
Pronamide (propyzamide)	$C_{12}H_{11}Cl_2NO$	amide	1	540
Propachlor	$C_{11}H_{14}ClNO$	chloroacetanilide	1	675
Propachlor oxanilic acid	$C_{11}H_{13}NO_3$	chloroacetanilide metabolite	20	AFA
Propamocarb HCl	$C_9H_{20}N_2O_2$	carbamate	14	AFU
Propanil	$C_9H_9Cl_2NO$	anilide	1	341
Propaquizafop	$C_{22}H_{22}ClN_3O_5$	aryloxyphenoxypropionic acid	17	ALK
Propargite	$C_{19}H_{26}O_4S$	sulfite	1	623
Propazine	$C_9H_{16}ClN_5$	triazine	9	333
Propetamphos	$C_{10}H_{20}NO_4PS$	phosphorothioate	11	636
Propham	$C_{10}H_{13}NO_2$	carbamate	14	310
Propiconazole	$C_{15}H_{17}Cl_2N_3O_2$	conazole	1	264
Propoxur	$C_{11}H_{15}NO_3$	carbamate	14	162
Prosulfuron	$C_{15}H_{16}F_3N_5O_4S$	triazinylsulfonyl urea	16	AEG
Prothiofos	$C_{11}H_{15}Cl_2O_2PS_2$	phenylorganothiophosphate	11	613

PDP Pesticide Codes and Multi-residue Compound Groupings for Fruit and Vegetables

Compound Name	Molecular Formula	Chemical Family	Group	Pesticide Code
Pymetrozine	$C_{10}H_{11}N_5O$	azomethine	9	ABF
Pyraclostrobin	$C_{19}H_{18}ClN_3O_4$	strobilurin	22	B61
Pyraflufen ethyl	$C_{15}H_{13}Cl_2F_3N_2O_4$	phenoxypyrazole	1	AGB
Pyrasulfotole	$C_{14}H_{13}F_3N_2O_4S$	benzoylpyrazole	1	AHK
Pyrazon (Chloridazon)	$C_{10}H_8ClN_3O$	pyridazinone	17	595
Pyrazophos	$C_{14}H_{20}N_3O_5PS$	organophosphate	11	553
Pyrethrins	$C_{21}H_{27}O_4$	pyrethrum, botanical	8	075
Pyridaben	$C_{19}H_{25}ClN_2OS$	pyridazinone	17	B56
Pyridalyl	C18H14Cl4F3NO3	pyridine	17	AHU
Pyrimethanil	$C_{12}H_{13}N_3$	pyrimidine	17	B16
Pyriproxyfen	$C_{20}H_{19}NO_3$	pyridine	17	B24
Quinalphos	$C_{12}H_{15}N_2O_3PS$	organothiophosphate	11	661
Quinoxyfen	$C_{15}H_8Cl_2FNO$	pyridine	17	B57
Quintozene (PCNB)	$C_6Cl_5NO_2$	benzene ring	3	304
Quizalofop ethyl	$C_{19}H_{17}ClN_2O_4$	aryloxyphenoxypropionic acid	20	750
Resmethrin	$C_{22}H_{26}O_3$	pyrethroid	8	556
RH 9129	$C_{19}H_{16}N_3ClO_2$	fenbuconazole metabolite	1	A54
RH 9130	$C_{19}H_{16}N_3ClO_2$	fenbuconazole metabolite	1	A55
Rimsulfuron	$C_{14}H_{17}N_5O_7S_2$	sulfonyl urea	16	AJF
S-(2-hydroxy)propyl EPTC	$C_9H_{19}NOS$	thiocarbamate	14	ACO
Saflufenacil	$C_{17}H_{17}ClF_4N_4O_5S$	urea	16	AHZ
Sethoxydim	$C_{17}H_{29}NO_3S$	cyclohexene oxime	28	AEV
Sethoxydim sulfoxide	$C_{17}H_{29}NO_4S$	cyclohexene oxime	28	AJR
Siduron	$C_{14}H_{20}N_2O$	urea	16	ACT
Simazine	$C_7H_{12}ClN_5$	triazine	9	149
Spinetoram	$C_{42}H_{69}NO_{10} + C_{43}H_{69}NO_{10}$	spinosyn (macrocyclic lactone)	29	AGY
Spinosad	$C_{41}H_{65}NO_{10} + C_{42}H_{67}NO_{10}$	spinosyn (macrocyclic lactone)	29	ABB
Spirodiclofen	$C_{21}H_{24}Cl_2O_4$	tetronic acid	27	B85
Spiromesifen	$C_{23}H_{30}O_4$	tetronic acid	27	AGT

PDP Pesticide Codes and Multi-residue Compound Groupings for Fruit and Vegetables

Compound Name	Molecular Formula	Chemical Family	Group	Pesticide Code
Spiromesifen enol metabolite	$C_{17}H_{20}O_3$	tetronic acid metabolite	27	AGU
Spiromesifen, total (including enol metabolite)	$C_{23}H_{30}O_4$ + $C_{17}H_{20}O_3$	tetronic acid	27	AFW
Spirotetramat	$C_{21}H_{27}NO_5$	tetramic acid insecticide	27	AHM
Spiroxamine	$C_{18}H_{35}NO_2$	unclassified	99	AJY
Sulfentrazone	$C_{11}H_{10}Cl_2F_2N_4O_3S$	triazole sulfonamide	1	AAY
Sulfometuron methyl	$C_{15}H_{16}N_4O_5S$	sulfonyl urea	16	ACP
Sulfosulfuron	$C_{16}H_{18}N_6O_7S_2$	pyrimidinylsulfonyl urea	16	ADS
Sulfotep	$C_8H_{20}O_5P_2S_2$	organophosphate	11	311
Sulprofos	$C_{12}H_{19}O_2PS_3$	organophosphate	11	609
Sulprofos O-analog	$C_{12}H_{19}O_3PS_2$	oxon	11	ACQ
TCMTB	$C_9H_6N_2S_3$	benzothiazole	17	793
Tebuconazole	$C_{16}H_{23}ClN_3O$	conazole	1	A58
Tebufenozide	$C_{22}H_{28}N_2O_2$	diacylhydrazine	16	ABG
Tebufenpyrad	$C_{18}H_{24}ClN_3O$	pyrazole	1	AJZ
Tebupirimfos	$C_{13}H_{23}N_2O_3PS$	organophosphate	11	A59
Tebupirimfos O-analog	$C_{13}H_{23}N_2O_4P$	oxon	11	ACR
Tebuthiuron	$C_9H_{16}N_4OS$	urea	16	780
Tecnazene	$C_6HCl_4NO_2$	nitrobenzene	3	147
Teflubenzuron	$C_{14}H_6Cl_2F_4N_2O_2$	benzoylphenylurea	16	AKA
Tefluthrin	$C_{17}H_{14}ClF_7O_2$	pyrethroid	8	B26
TEPP	$C_8H_{20}O_7P_2$	organophosphate	11	088
Tepraloxydim	$C_{17}H_{24}ClNO_4$	cyclohexene oxime	28	AHL
Terbacil	$C_9H_{13}ClN_2O_2$	uracil	16	152
Terbufos	$C_9H_{21}O_2PS_3$	phosphorothioate	11	205
Terbufos O-analog	$C_9H_{21}O_3PS_2$	oxon	11	A60
Terbufos sulfone	$C_9H_{21}O_4PS_3$	sulfone	11	963
Terbuthylazine	$C_9H_{16}ClN_5$	chlorotriazine	9	678
Tetrachlorvinphos	$C_{10}H_9Cl_4O_4P$	chlorethylene phosphate	11	176
Tetraconazole	$C_{13}H_{11}Cl_2F_4N_3O$	conazole	1	B72

PDP Pesticide Codes and Multi-residue Compound Groupings for Fruit and Vegetables

Compound Name	Molecular Formula	Chemical Family	Group	Pesticide Code
Tetradifon	$C_{12}H_6Cl_4O_2S$	bridged biphenyl	3	108
Tetrahydrophthalimide (THPI)[1]	$C_8H_9NO_2$	phthalimide	1	624
Tetramethrin	$C_{19}H_{25}NO_4$	pyrethroid	8	947
Thiabendazole	$C_{10}H_7N_3S$	benzimidazole	1	157
Thiacloprid	$C_{10}H_9ClN_4S$	neonicotinyl	1	B68
Thiamethoxam	$C_8H_{10}ClN_5O_3S$	neonicotinyl	1	B43
Thiazopyr	$C_{16}H_{17}F_5N_2O_2S$	pyridine	17	B12
Thifensulfuron	$C_{11}H_{11}N_5O_6S_2$	sulfonyl urea	16	AEF
Thifensulfuron methyl	$C_{12}H_{13}N_5O_6S_2$	triazinylsulfonyl urea	16	AEQ
Thiobencarb	$C_{12}H_{16}ClNOS$	thiocarbamate	14	726
Thiodicarb	$C_{10}H_{18}N_4O_4S_3$	carbamate	14	943
Thiophanate methyl	$C_{12}H_{14}N_4O_4S_2$	carbamate	14	611
Thymol	$C_{10}H_{14}O$	phenol	3	ALG
Tolclofos methyl	$C_9H_{11}Cl_2O_3PS$	organophosphate	11	B70
Tolyfluanid	$C_{10}H_{13}Cl_2FN_2O_2S_2$	phenylsulfamide	1	649
Toxaphene	$C_{10}H_{10}Cl_8$	organochlorine	3	090
Tralomethrin	$C_{22}H_{19}Br_4NO_3$	pyrethroid	8	755
Triadimefon	$C_{14}H_{16}ClN_3O_2$	conazole	1	608
Triadimenol	$C_{14}H_{18}ClN_3O_2$	conazole	1	638
Triallate	$C_{10}H_{16}Cl_3NOS$	thiocarbamate	14	621
Triasulfuron	$C_{14}H_{16}ClN_5O_5S$	sulfonyl urea	16	ADP
Triazole acetic acid	$C_4H_6N_3O_2$	triazole metabolite	1	ADX
Triazole alanine	$C_5H_8N_4O_2$	triazole metabolite	1	ADW
Triazophos	$C_{12}H_{16}N_3O_3PS$	organothiophosphate	11	536
Tribenuron methyl	$C_{15}H_{17}N_5O_6S$	triazinylsulfonyl urea	16	ACS
Trichlorfon (as dichlorvos)	$C_4H_8Cl_3O_4P$	phosphate	11	130
Triclopyr	$C_7H_4Cl_3NO_3$	acetic acid	20	731
Trifloxystrobin	$C_{20}H_{19}F_3N_2O_4$	strobilurin	22	B79
Trifloxysulfuron	$C_{14}H_{14}F_3N_5O_6S$	sulfonyl urea	16	AJG

PDP Pesticide Codes and Multi-residue Compound Groupings for Fruit and Vegetables

Compound Name	Molecular Formula	Chemical Family	Group	Pesticide Code
Triflumizole	$C_{15}H_{15}ClF_3N_3O$	conazole	1	A61
Trifluralin	$C_{13}H_{16}F_3N_3O_4$	dinitroaniline	7	151
Triforine	$C_{10}H_{14}Cl_6N_4O_2$	formamide	1	915
Triticonazole	$C_{17}H_{20}ClN_3O$	conazole	1	ADR
Uniconazole	$C_{15}H_{18}ClN_3O$	conazole	1	AJJ
Vernolate	$C_{10}H_{21}NOS$	thiocarbamate	14	201
Vinclozolin	$C_{12}H_9Cl_2NO_3$	dichloroanilide	1	529
Zoxamide	$C_{14}H_{16}Cl_3NO_2$	benzamide	1	B44

[1] Metabolite of captan and captafol.

EPA, Codex, and Food and Drug Administration (FDA) Pesticide Analytical Manual (PAM) Commodity Groupings

Commodity		PDP Code	PDP Commodity Group	EPA	Codex	PAM	
Almonds		AL	Cereal Grains (High Oil)	Tree nuts	Tree nuts	N/A	
Apples	Fruit	AP	Fruits and Vegetables	Pome fruits	Pome fruits	Non-fatty	Med. Sugar
	Juice	AJ			Fruit juice		Med. Sugar
	Sauce	AC			Manufactured food single ingredient		High Sugar
	Baby Food	IA			Manufactured food single ingredient		
	Single serving	AX			Pome fruits		Med. Sugar
Asparagus		AS	Fruits and Vegetables	Miscellaneous	Stalk & stem vegs.	Non-fatty	Low Sugar
Avocado		AV	Fruits and Vegetables	Miscellaneous	Assorted tropical & sub-tropical fruits - inedible	Fatty	Low Sugar
Bananas		BN	Fruits and Vegetables	Miscellaneous	Assorted tropical & sub-tropical fruits - inedible	Non-fatty	High Sugar
Barley		BY	Cereal Grains (Low Oil)	Cereal grains	Cereal grains	Non-fatty	Low Water
Beans, canned	Black	BC	Fruits and Vegetables	Legume vegs.	Legume vegs.	Non-fatty	Low Water
	Garbanzo (Chick					Fatty	Low Sugar
	Kidney					Non-fatty	Low Water
	Pinto					Non-fatty	Low Water
	Baby Food	IG	Fruits and Vegetables		Manufactured food single ingredient	Non-fatty	Low Sugar
Beets		BT	Fruits and Vegetables	Root & Tuber vegs.	Root & tuber vegs.	Non-fatty	N/A
Beef	Adipose	BA	Animal Tissue/High Protein	Meat	Meat	N/A	
	Liver	BL					
	Muscle	BM					
Blueberry		BB	Fruits and Vegetables	Berry & Small Fruit	Berries & other small fruits	Non-fatty	Med. Sugar
Broccoli		BR	Fruits and Vegetables	Brassica leafy vegs.	Brassica leafy vegs.	Non-fatty	Low Sugar
Butter		BU	Dairy Products	Dairy	Derived milk products	Fatty	Low Water
Cabbage		CG	Fruits and Vegetables	Brassica leafy vegs.	Brassica leafy vegs.	Non-fatty	Low Sugar
Cantaloupe		CN	Fruits and Vegetables	Cucurbits	Cucurbits	Non-fatty	Med. Sugar
Carrots	Fresh	CR	Fruits and Vegetables	Root & tuber vegs.	Root & tuber vegs.	Non-fatty	Med. Sugar
	Baby Food	IC			Manufactured food single ingredient		
Cauliflower		CF	Fruits and Vegetables	Brassica leafy vegs.	Brassica leafy vegs.	Non-fatty	Low Sugar
Celery		CE	Fruits and Vegetables	Leafy vegs.	Stalk & stem vegs.	Non-fatty	Low Sugar
Cherries, Sweet		CH	Fruits and Vegetables	Stone fruits	Stone fruits	Non-fatty	Med. Sugar
Cilantro		CL	Fruits and Vegetables	Herbs & Spices	Herbs & Spices	N/A	
Corn	Grain	CO	Cereal Grains (Low Oil)	Cereal grains	Cereal grains	Fatty	Low Water
	Sweet	CS	Fruits and Vegetables		Cereal grains	Non-fatty	Med. Sugar
	Syrup	CY	Single Commodities		Derived edible plant products	N/A	
Cranberry		CA	Fruits and Vegetables	Berry & Small Fruit	Berries & other small fruits	Non-fatty	N/A
Cream, heavy		CM	Dairy Products	Dairy	Derived milk products	Fatty	Low Sugar
Cucumbers		CU	Fruits and Vegetables	Cucurbits	Cucurbits	Non-fatty	Low Sugar
Egg		EG	Animal Tissue/High Protein	Miscellaneous	Poultry products	Non-fatty	N/A
Eggplant		EP	Fruits and Vegetables	Fruiting vegs.	Fruiting vegs.	Non-fatty	Low Sugar
Fish, Catfish		FC	Single Commodities or	Miscellaneous	Aquatic animal products	Fatty	No sugar
Fish, Salmon		FS	Animal Tissue/High Protein	Miscellaneous	Aquatic animal products	Fatty	No sugar
Grapefruit		GF	Fruits and Vegetables	Citrus fruits	Citrus fruits	Non-fatty	Med. Sugar

Commodity		PDP Code	PDP Commodity Group	EPA	Codex	PAM	
Grapes	Fruit	GR	Fruits and Vegetables	Berry & Small Fruit	Berries & other small fruits	Non-fatty	High Sugar
	Juice	GJ			Fruit juice		Med. Sugar
Green Beans	Raw, fresh	GB	Fruits and Vegetables	Legume vegs.	Legume vegs.	Non-fatty	Low Sugar
	Baby Food	IG			Manufactured food single ingredient		
Greens	Collard	GS	Fruits and Vegetables	Brassica leafy vegs.	Leafy vegs. (including Brassica leafy vegs.)	Non-fatty	Low Sugar
	Kale	GK					
Honey		HY	Single Commodities	Miscellaneous		Non-fatty	High Sugar
Honey Dew Melon		HD	Fruits and Vegetables	Cucurbits	Cucurbits	Non-fatty	N/A
Infant formula, dairy-based		DF	Single Commodities		Manufactured food multiple ingredient	N/A	N/A
Infant formula, soy-based		YF	Single Commodities		Manufactured food multiple ingredient	N/A	N/A
Kiwi Fruit, Fresh		KW	Fruits and Vegetables	Berry & Small Fruit	Assorted tropical & sub-tropical fruits - inedible peel	Non-fatty	Med. Sugar
Lemons		LM	Fruits and Vegetables	Citrus fruits	Citrus fruits	Non-fatty	Low Sugar
Lettuce	Bunch	LT	Fruits and Vegetables	Leafy vegs.	Leafy vegs.	Non-fatty	Low Sugar
	Bagged	LB					
Mangoes		MA	Fruits and Vegetables	Miscellaneous	Assorted tropical & sub-tropical fruits - inedible	Non-fatty	Med. Sugar
Milk, whole		MK	Dairy Products	Dairy	Milks	Fatty	Low Sugar
Mushrooms		MU	Fruits and Vegetables	Edible fungi	Fruiting vegs.	Non-fatty	Low Sugar
Nectarines		NE	Fruits and Vegetables	Stone fruits	Stone fruits	Non-fatty	Med. Sugar
Oats		OA	Cereal Grains (Low Oil)	Cereal grains	Cereal grains	Fatty	Low Water
Onions	Bulb	ON	Fruits and Vegetables	Bulb vegs.	Bulb vegs.	Non-fatty	Low Sugar
	Green	GO					
Orange	Fruit	OG	Fruits and Vegetables	Citrus fruits	Citrus fruits	Non-fatty	Med. Sugar
	Juice	OJ			Fruit juice		
Peaches	Fruit	PC	Fruits and Vegetables	Stone fruits	Stone fruits	Non-fatty	Med. Sugar
	Single serving	CX					
	Baby Food	IH			Manufactured food single ingredient		
Papaya		YA	Fruits and Vegetables	Miscellaneous	Assorted tropical & sub-tropical fruits - inedible	Non-fatty	Med. Sugar
Peanut Butter		PB	Cereal Grains (High Oil)	Miscellaneous	Manufactured food single ingredient	Fatty	Med. Sugar
Pears	Fruit	PE	Fruits and Vegetables	Pome fruits	Pome fruits	Non-fatty	Med. Sugar
	Juice	PJ			Derived edible plant products	N/A	
	Canned	CP			Pome fruits	Non-fatty	Med. Sugar
	Single serving	PX					
	Baby Food	IP			Manufactured food single ingredient		
Peas	Vegetable	PS	Fruits and Vegetables	Legume vegs.	Legume vegs.	Non-fatty	Low Sugar
	Baby Food	IE			Manufactured food single ingredient		
Peppers	Bell	PP	Fruits and Vegetables	Fruiting vegs.	Fruiting vegs.	Non-fatty	Low Sugar
	Hot	HP					
Pineapples		PN	Citrus & High Acid Fruits/Juices	Miscellaneous	Assorted tropical & sub-tropical fruits - inedible	Non-fatty	Med. Sugar
Plums		PU	Fruits and Vegetables	Stone fruits	Stone fruits	Non-fatty	Med. Sugar
Pork	Adipose	KA	Animal Tissue/High Protein	Meat	Meat	N/A	
	Muscle	KM					
Potatoes		PO	Fruits and Vegetables	Root & tuber	Root & tuber vegs.	Non-fatty	Low Sugar

Commodity		PDP Code	PDP Commodity Group	EPA	Codex	PAM	
Poultry	Adipose	PA	Animal Tissue/High Protein	Meat	Poultry meat	N/A	
	Breast	PR					
	Liver	PL					
	Muscle	PM					
	Thigh	PT					
Raspberries	Fresh	RS	Fruits and Vegetables	Berry & Small Fruit	Berries & other small fruits	Non-fatty	N/A
	Frozen	RZ					
Raisins		RA	Single Commodities	Berry & Small Fruit	Dried fruits	Non-fatty	High sugar
Rice		RI	Cereal Grains (Low Oil)	Cereal grains	Cereal grains	Non-fatty	Low Sugar
Snap Peas		SN	Fruits and Vegetables	Legume vegs.	Legume vegs.	Non-fatty	Low Sugar
Soybeans, Grain		SY	Cereal Grains (High Oil)	Legume vegs.	Legume vegs.	Fatty	Med Sugar
Spinach	Leafy	SP	Fruits and Vegetables	Leafy vegs.	Leafy vegs.	Non-fatty	Low Sugar
	Canned	SC			Manufactured food single ingredient		
Squash	Summer	SS	Fruits and Vegetables	Cucurbits	Cucurbits	Non-fatty	Low Sugar
	Winter	WS					
	Winter, frozen	WZ					
Strawberries	Fresh	ST	Fruits and Vegetables	Berry & Small Fruit	Berries & other small fruits	Non-fatty	Med. Sugar
	Frozen	SZ					
Sweet Potatoes	Raw, fresh	SW	Fruits and Vegetables	Root & tuber vegs.	Root & tuber vegs.	Non-fatty	Med. Sugar
	Baby Food	IS			Manufactured food single ingredient	Non-fatty	Med. Sugar
Tangerines		TA	Fruits and Vegetables	Citrus fruits	Citrus fruits		
Tomatoes	Cherry/Grape	CT	Fruits and Vegetables	Fruiting vegs.	Fruiting vegs.	Non-fatty	Low Sugar
	Fresh	TO					
	Canned	TC					
	Paste	TP	Single Commodities		Manufactured food single ingredient	N/A	
Water	Bottled	WB	Water	Miscellaneous	N/A	N/A	N/A
	Drinking	WR					
	Ground	WG					
	Untreated	WU					
Watermelon		WM	Fruits and Vegetables	Cucurbits	Cucurbits	Non-fatty	Med. Sugar
Wheat	Grain	WH	Cereal Grains (Low Oil)	Cereal grains	Cereal grains	N/A	
	Flour	WF			Cereal grains, milling fraction		

Commodity		% Fat[1]	% Water[1]	% Sugar[1]	pH[2]
Almonds					
Apples	Fruit	0.36	83.93	11.5	3.30 -4.00
	Juice	0.11	87.93	10.9	3.35-4.00
	Sauce	0.18	79.58	16.5	3.10-3.60
Asparagus		0.22	92.25	2.1	6.00-6.70
Avocado		8.87-17.33	72.56-79.73	0.9	6.27-6.58
Bananas		0.48	74.26	18.4	4.50-5.20
Barley		1.16	10.09		5.19-5.32
Beans	Black	1.42	11.02		5.78-6.02
	Garbanzo (Chick pea)	6.04	11.53	3.8	6.48-6.80
	Kidney	1.06	11.75		5.40-6.00
	Pinto	1.13	10.95		
	Baby Food	0.1	92.5		
Beef					
Beets		0.06	92.15		5.30-6.60
Blueberry		0.38	84.61	7.3	3.12-3.33
Broccoli		0.35	90.69	1.6	6.30-6.52
Butter		81.11	17.94		
Cabbage		0.18	92.52	2.7	5.20-6.80
Cantaloupe		0.28	89.78	8.1	6.13-6.58
Carrots		0.19	87.79	6.6	5.88-6.40
Cauliflower		0.18	92.26	2.2	5.60
Celery		0.14	94.64	1	5.70-6.00
Cherries, sweet		0.96	80.76	14.6	4.01-4.54
Cilantro					
Corn	Grain	2.08	10		
	Sweet	1.18	75.96	5.4	5.90-7.30
	Syrup				
Cranberry		0.2	86.54		
Cream, heavy		37	57.71	2.8	6.50-6.68
Cucumbers		0.13	96.05	2.3	5.12-5.78
Eggplant		0.1	91.93	3.4	5.50-6.50
Fish, catfish		4.26	76.39	0	
Fish, salmon		3.4-10.44	68.5-76.35	0	
Grapefruit		0.1	90.89	6.2	3.00-3.75
Grapes	Fruit	0.35	81.3	16.4	2.90-3.82
	Juice	0.08	84.12	14.2	
Green Beans		0.12	90.27	2.6	5.60
Greens	Collard	0.22	90.55		
	Kale	0.7	84.46	2.2	6.36-6.80
Honey		0	17.2	81.9	3.70-4.20
Honey Dew Melon		0.1	89.66		6.00 - 6.67
Infant formula, dairy-based					
Infant formula, soy-based					
Lettuce		0.19	95.89	1.8	5.80-6.15
Mangoes		0.27	81.71	14.8	3.40 - 4.80
Milk, whole		3.66	87.69	4.9	6.40-6.80
Mushrooms		0.42	91.81	1.8	6.00-6.70
Nectarines		0.46	86.28	8.5	3.92-4.18
Oats		6.9	8.22	5.9	
Onions	Bulb	0.16	89.68	4.1	5.30-5.85
	Green	0.19	89.83	3.2	6.20
Oranges	Fruit	0.12	86.75	8.9	3.60-4.34
	Juice	0.2	88.3	10.2	3.30-4.19
Papaya		0.14	88.83		

Commodity		% Fat[1]	% Water[1]	% Sugar[1]	pH[2]
Peaches		0.09	87.66	8.7	3.30-4.05
Peanut Butter		49.98	1.42	7.8	6.28
Pears	Fruit	0.4	83.81	10.5	3.50-4.60
	Juice				
Peas		0.4	78.86	4.5	5.70-6.70
Peppers	Bell	0.19	92.19	2.5	5.20-5.93
	Hot	0.2	87.74		4.65 - 5.45
Pineapples		0.43	86.5	11.9	3.20-4.00
Plums		0.62	85.2	7.5	2.80-4.30
Pork					
Potatoes		0.1	78.96	1.0	5.40-5.90
Poultry					
Raisins		0.46	15.42	61.7	3.80-4.10
Raspberries		0.55	86.57		3.18-3.95
Rice		0.58	12.89	0.5	6.0.-6.70
Soybeans		19.94	8.54	6.6	
Spinach		0.35	91.58	0.4	5.50-6.80
Squash	Summer	0.21	93.68	2.2	5.79-6.10
	Winter	0.23	88.72	2.2	5.18-6.49
Strawberries		0.37	91.57	5.7	3.00-3.90
Sweet Potatoes		0.3	72.84	5.0	5.30-5.60
Tangerines		0.19	87.6		
Tomatoes	Fresh	0.33	93.76	3.0	4.30-4.90
	Paste				3.50-4.70
Watermelon		0.43	91.51	9	5.18-5.60
Wheat	Grain				
	Flour				

1 = Pesticide Analytical Manual (PAM) data
2 = Center for Food Safety and Applied Nutrition data

Data not avalilable
Fatty (>2% fat)
Non-fatty (<2% fat)
Low H_2O (<75%)
Low sugar (<5%)
Med sugar (5-15%)
High sugar (>15%)

USDA, AMS Pesticide Data Program
Verification of Limits of Detection (LODs)

Commodity: ______________________________

Date: ______________________________

Lab: ______________________________

Note: During method validation, two spikes are required; if this form is used to record annual spike verification, only one spike is required.

Pesticide/Compound	Amt Spk	LOD Spike Recovered (yes/no or +/-)	
	Units =	Spike 1	Spike 2

USDA, AMS Pesticide Data Program
Determination of Method Range

Commodity: _____ **Instrument/Detector:** _____

Date: _____ **Column:** _____

Lab: _____

Pesticide/Compound			1 X LOQ					5 X LOQ					10 X LOQ				
	LOD	LOQ	Rep 1	Rep 2	Rep 3	Mean	%CV	Rep 1	Rep 2	Rep 3	Mean	%CV	Rep 1	Rep 2	Rep 3	Mean	%CV
	Units=		Percent Recovery					Percent Recovery					Percent Recovery				

USDA, AMS Pesticide Data Program
Precision and Accuracy Data Collection

Commodity: _____ **Instrument/Detector:** _____

Date: _____ **Column:** _____

Lab: _____

Pesticide/Compound			2xLOQ Matrix Spikes							Mean	%CV	Comments
	LOD	LOQ	1	2	3	4	5	6	7			
	Units=		Percent Recovery							%R		

Process Control and Spike Recovery Acceptability Flowchart