STANDARD OPERATING PROCEDURE
Procedure for Sampling Pesticide Application Equipment

KEY WORDS

Application, bailer, Mityvac®, percent active ingredient (AI), tank mix, tank sampling

APPROVALS

Original Signed by 7/28/20
APPROVED BY: _____ DATE: _____
Edgar Vidrio
Environmental Monitoring Branch Management

7/28/20
APPROVED BY: *Original Signed by* _____ DATE: _____
David Kim
Environmental Monitoring Branch, Senior Environmental Scientist

APPROVED BY: *Original Signed by* _____ DATE: *7/28/20*
Chang-Sook Lee Peoples
Environmental Monitoring Branch, Quality Assurance Officer

PREPARED BY: *Original Signed by Carissa Ganapathy* DATE: *7/28/20*
Rach Pitts
Environmental Monitoring Branch, Scientific Aid

Environmental Monitoring Branch organization and personnel, such as management, senior scientist, quality assurance officer, project leader, etc., are defined and discussed in SOP ADMN002.01.

Previous author: Roger Sava, Heidi Dietrich

1.0 INTRODUCTION

Analyses of tank samples determine the percentage of active ingredient (AI) and trace contaminants in the application mix. The analysis is also a test of the accuracy of the mixing-loading process and can be used to determine if the rate was sufficient to achieve expected efficacy by comparing the laboratory results to the label rate. Further, the amount of AI applied per unit area can be calculated using the percentage of AI in the tank sample and the rate of application per unit area.

Selection of sampling devices, techniques, and sample containers will vary depending on the chemical and application equipment. Samples are collected at the spray tip nozzle (point of delivery), or directly from the tank when a nozzle sample is not practical. All tank sampling should be considered potentially hazardous and be performed with extreme caution according to the pesticide label, the DPR Field Health and Safety Guide (DPR, 2019), and safety procedures outlined in this SOP.

1.1 Purpose

This SOP provides technical guidance for collecting pesticide tank samples during applications. Site conditions, equipment, and the limitations imposed by safety procedures will dictate specific methods to be used.

1.2 Definitions

1.2.1 **Active Ingredient (AI):** The biologically active and usually the pure or technical form of a chemical in a pesticide formulation. A given formulation may have one or more active ingredients.

1.2.2 **Mixing-Loading Equipment:** Equipment that mixes and loads pesticide into a ground or aerial application system. Some mixer-loaders are closed systems to prevent human exposure.

2.0 MATERIALS

The following are supplies commonly used for tank sampling. Other materials can be used if they conform to the requirements of this SOP.

2.1 Personal protective equipment (PPE) required by the pesticide label: pesticide resistant coveralls, gloves, boots, and eye protection.

2.2 Sample containers: glass, polypropylene, or polycarbonate bottles with sealable lids and labeled with sample numbers.

2.3 Cleanup supplies: soap and water, garbage bags, alcohol, disposable towels.

2.4 Plastic tarp or large plastic bag to place on the ground for spill protection.

2.5 Appropriate size disposable plastic bags to cover the bottle while sampling, a latex glove can also be used.

2.6 Hand-operated vacuum pump (Mityvac®) or siphon pump.

2.7 Tubing and bottles for vacuum pump sampling.

2.8 Bailer (disposable).

2.9 Aluminum foil.

2.10 16 oz/500 mL Nalgene® Amber HDPE wide mouth bottles or canning jars with bands and seals.

2.11 Stainless steel bucket.

2.12 Sealable plastic bags to place each sample bottle in after sampling.

2.13 Ice chest or Expanded Polystyrene (EPS) container to store and transport samples.

2.14 Wet ice, dry ice for granular formulations.

2.15 Chain of Custody (COC) see Figure 5.

2.16 Pesticide label.

3.0 PROCEDURES

NOTE: Consult the DPR Health and Safety Officer if the product to be sampled is a category II or higher.

3.1 Preparation, contamination prevention, and bagging of sample

3.1.1 Collect a “well-mixed” sample after the tank agitators have been running but not while they are mixing. This is a safety measure to minimize

breathing in powders and to avoid spray-back due to pressure. This is described in sections 3.2 – 3.6 for each type of application equipment.

3.1.2 Survey the area and apparatus to be sampled and decide the preferred method for collecting the tank sample. Wear PPE including chemical resistant gloves, safety glasses, long sleeves or Tyvek® sleeves (or Tyvek® suit), pants, and closed toe shoes.

3.1.3 Cover each sample container with a plastic bag or glove to prevent contaminating the outside surface of the container (Figure 1). Place the sample container on the plastic tarp or large plastic bag near the tank to be sampled. Have paper towels, plastic bags, foil, and bottled water or a hose available nearby, but not located where the items could be contaminated.

Figure 1. 500 mL polypropylene bottle with a glove as a cover.

3.1.4 Sampling should be performed in teams of two people: “dirty” and “clean.” The purpose of the rinsing and bagging procedure is to prevent contamination of samples, storage equipment, and the laboratory.

3.1.5 Generally a 3/4 filled container is a sufficient sample size. Check with the laboratory to verify the volume needed for analysis prior to collecting the sample. This helps to minimize hazardous waste disposal at the laboratory.

3.1.6 Designate one person as “dirty” to place the tarp on the ground and prepare the sample container. Once the container is filled by the applicator (see sections 3.2 - 3.6), the “dirty” person replaces the cap and brings the sample container over to the designated rinse area. Cap all containers tightly.

3.1.7 The “dirty” person removes the plastic bag or glove from the bottle and, if clean, places the bottle into a sealable plastic bag that the “clean” person holds open, and then disposes the of the soiled bag/glove.

3.1.8 If any sample is splashed/spilled on the exterior of the bottle, the “dirty” person removes the bag/glove then rinses the bottle with water, dries the bottle with clean paper towels, then places the bottle into a sealable plastic bag that the “clean” person holds open, and disposes the soiled bag/glove.

3.1.9 The “clean” person then holds open a new sealable plastic bag and the “dirty” person places the container in a second bag. The “clean” person repeats this step so that the sample container is triple bagged, then places the bagged bottle in the ice chest.

3.1.10 Follow steps in section 3.8 for packing and transporting the sample.

3.2 Tank sampling from a wand or spray nozzle

3.2.1 Prepare bottles and plan the sampling process as described in section 3.1.

3.2.2 Prior to collecting the sample, instruct the operator to apply the mix to the treatment site according to their standard procedures. If the mix cannot be applied, then instruct the operator to circulate the mixture through the hose and spray nozzle while directing the material back into the tank (Figure 2). Circulating the material in this manner for at least 5 minutes should assure a well-mixed sample.

3.2.3 When possible, to lessen the chance of spray-back when collecting the sample, always turn off the agitator or re-circulating pumps with the hoses still extended. Collect the sample immediately to ensure the tank is well mixed.

Figure 2. Applicator circulating the mixture by directing spray back into the tank.

3.2.4 Place the covered sample container on the ground or give to the operator to fill. Do not hold the sample container while it is being filled. The operator can then reduce the line pressure and direct the flow into the sample container. If installed, instruct the operator to have the ball valve that controls the flow turned to the “off” position before pressing the trigger, then slowly open up the valve. If there is little to no flow, instruct the second operator to reel in the hose while the first operator has the valve and trigger open.

3.2.5 Follow steps in section 3.8 for packing and transporting the sample.

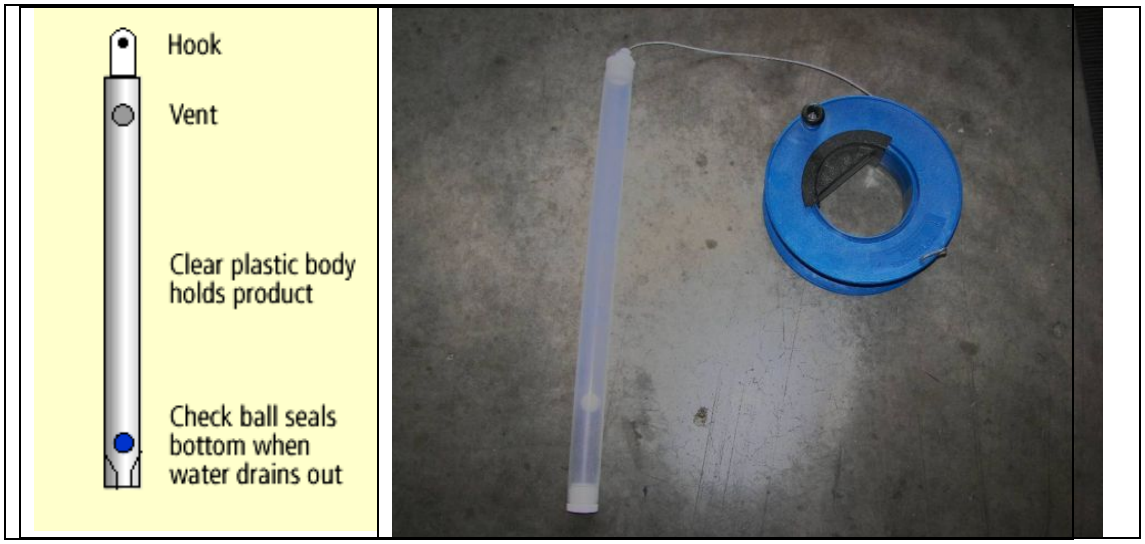
3.3 Using a bailer to collect a sample directly from a tank

3.3.1 Prepare bottles and plan the sampling process as described in section 3.1.

3.3.2 Instruct the operator to run the agitator or recirculation pump for 3 to 5 minutes to assure a well-mixed sample.

3.3.3 Instruct the operator to turn off the agitators. Immediately lower the bailer (Figure 3) slowly into the tank.

Figure 3. Bailer diagram and photo.



3.3.4 Allow the bailer to fill to the volume needed for laboratory analysis and retrieve it from the tank.

3.3.5 Lower the bailer to the bottom of a clean stainless steel bucket or into a jar larger than the bailer itself to release the ball and liquid. Carefully transfer the contents of the bucket or jar into the labeled sample bottles through a stainless steel or disposable plastic funnel.

3.3.6 Decant excess tank mix not needed for the sample back into the tank. Dispose of the bailer properly (see section 4.0).

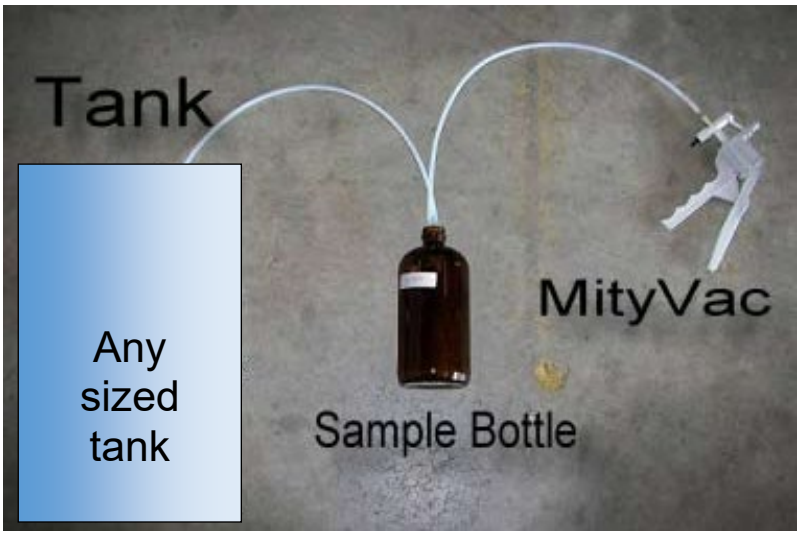
3.3.7 Follow steps in section 3.8 for packing and transporting the sample.

3.4 Using a hand operated vacuum pump (Mityvac®) or siphon pump to collect a sample directly from a tank

3.4.1 Prepare bottles and plan the sampling process as described in section 3.1.

3.4.2 The Mityvac® (Figure 4) attached to a vented rubber stopper fitted to a sample bottle creates a partial vacuum to draw the tank mix into the sample bottle. Available hand operated siphon pumps work well in some cases but cannot be cleaned and reused.

Figure 4. Mityvac® with tube attached to a vented rubber stopper fitted to a sample bottle and second tube placed in a pesticide tank (size and type of tank vary).



3.4.3 Attach a length of tubing from the hand pump to the sample bottle and a length of tubing from the sample bottle to the tank.

3.4.4 Pump the handle to create a partial vacuum and draw the tank mix into the sample bottle.

3.4.5 If using a “collection only” bottle, remove the rubber stopper from the collection bottle and transfer the sample to a labeled sample container.

3.4.6 Dispose of the contaminated tubing and collection bottle properly (see section 4.0). If the chemical came in contact with the Mityvac® it must be thoroughly washed and rinsed with alcohol.

3.4.7 Follow steps in section 3.8 for packing and transporting the sample.

3.5 To sample from an aircraft, boom, or truck with multiple spray nozzles

3.5.1 Prepare bottles and plan the sampling process as described in section 3.1.

3.5.2 Use one quart canning jars with bands and lids or aluminum foil in place of the seals. Make a small hole in the lid or foil to insert the spray nozzle and minimize splashing.

3.5.3 Place a sample jar under each nozzle with a 5-gallon bucket held in place under each sample jar to contain excess mixture. This process requires a sampler staff member at each nozzle position.

3.5.4 Hold the sample jars under the nozzles and direct the operator to activate the spray pump when all sampler staff are ready. When the sample jars are sufficiently filled, instruct the operator to turn off the spray pump.

3.5.5 Combine the sub-samples into a cleaned stainless steel bucket and pour a well-mixed aliquot into a labeled sample container using a cleaned stainless steel funnel.

3.5.6 Decant excess tank mix from the stainless steel bucket back into the tank when possible and safe to do so.

3.5.7 Follow steps in section 3.8 for packing and transporting the sample.

3.6 Granular chemical collection

3.6.1 Prepare bottles and plan the sampling process as described in section 3.1.

3.6.2 Use a new unused jar to scoop out the desired amount of sample. Transfer the sample to a labeled sample container.

3.6.3 Cap and store on dry ice in an EPS.

3.6.4 Follow steps in section 3.8 for packing and transporting the sample.

3.7 Methods not covered by this SOP

If none of these methods are suitable, great attention to safety and preservation of sample integrity will be necessary for any new method.

3.8 Packing and transporting samples

3.8.1 After following section 3.1 to properly prepare and prevent contamination of the sample, follow these steps for transporting the sample.

3.8.2 Fill out the appropriate COC according to ADMN006.

3.8.3 Package the triple-bagged sample in an ice chest with the proper type of ice as called for in the sections above. Ice chests designated for tank samples should never be used to store or ship other environmental samples.

3.8.4 Check with the carrier for shipping labeling requirements and restrictions for pesticide samples.

3.8.5 Whenever possible, obtain a copy or keep a clean pesticide label from the application.

4.0 CLEAN UP

It is best to have the applicator dispose of the used sampling supplies, such as Tyvec® suits, gloves, bailer, and plastic bags, generated during the sampling process. If you cannot dispose of the used sampling supplies on-site, then double bag them for safe transport. It is always best to choose disposable supplies for tank sampling. Never reuse sample containers.

5.0 SAFETY

5.1 Hazards

5.1.1 Consider all sampling materials as potentially hazardous and all staff must follow U.S. EPA, OSHA, pesticide label requirements, and provisions of the DPR Field Health and Safety Guide (DPR, 2019).

5.1.2 It is imperative that the safety of the sampling staff is of utmost concern when tank sampling. Hazards associated with tank sampling may cause bodily injury, illness, or death to the worker. Failure to recognize potential hazards is the cause of most accidents.

5.1.3 Specific hazards include ambient air, liquids, and solids that can be toxic, flammable, asphyxiating, or corrosive to the body as well as to equipment.

5.1.4 Use extreme caution if sampling requires climbing on or around a tank, a narrow space, or a ladder while wearing protective clothing and carrying sampling equipment.

5.1.5 Keep a copy of the pesticide label or Safety Data Sheet (SDS) information and know the intended percent concentration of the chemical.

5.1.6 Communication between all of the sampling staff and the pesticide operators is very important to prevent exposure to hazards or and to prevent injury.

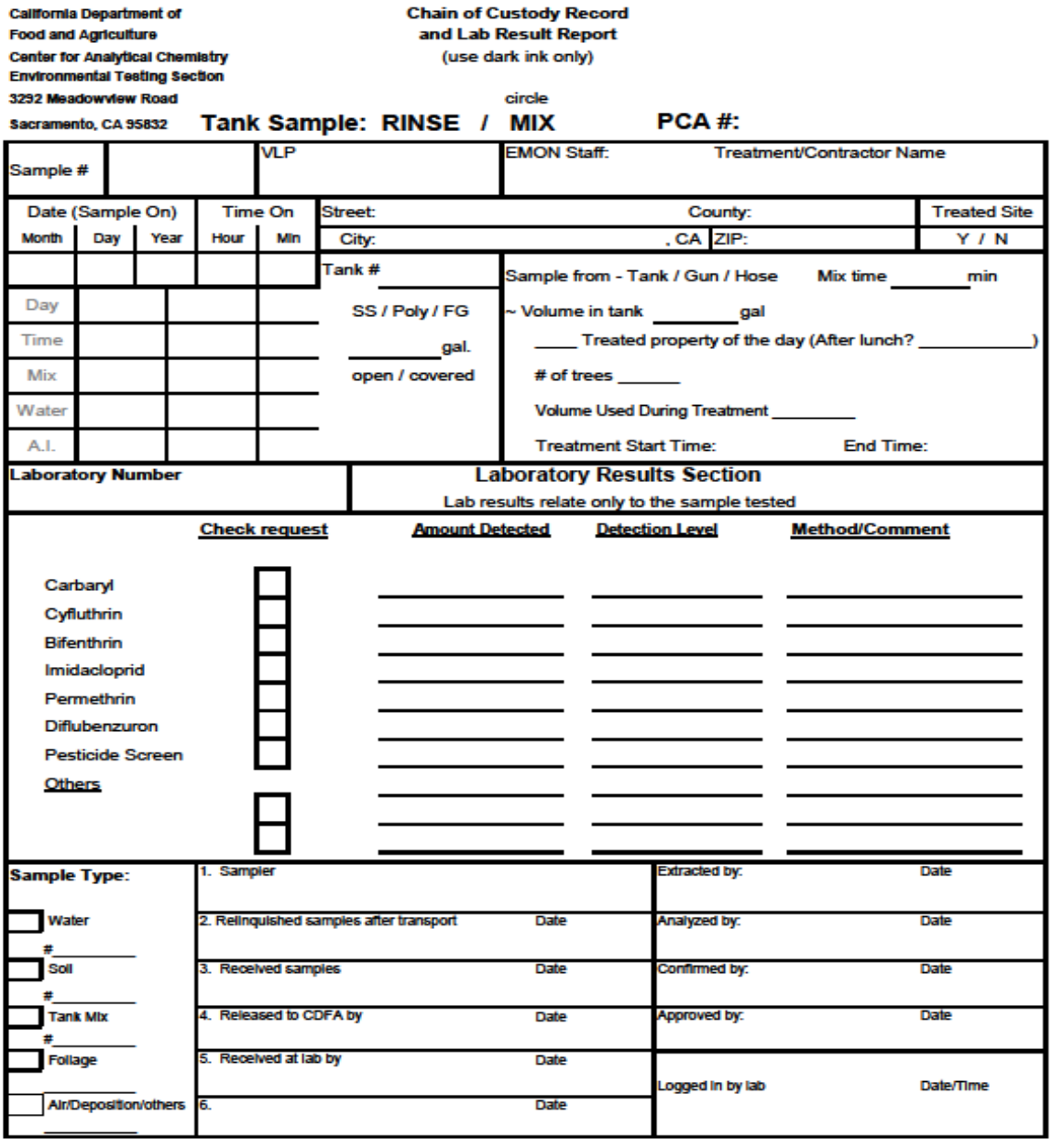
6.0 REPORTING REQUIREMENTS

A record, e.g. COC (Figure 5), should be completed on-site to note important information about the pesticide mixture, including when and how the product was mixed. Obtain this information directly from the person who mixed the product.

7.0 REFERENCES

Department of Pesticide Regulation (DPR) 2019, Field Safety Manual. California Department of Pesticide Regulation Human Resources Branch, Health and Safety Unit, Sacramento, California.

Figure 5. Example of a tank sampling COC.



California Department of Food and Agriculture
Center for Analytical Chemistry
Environmental Testing Section
3292 Meadowview Road
Sacramento, CA 95832

Chain of Custody Record and Lab Result Report
(use dark ink only)

circle
Tank Sample: RINSE / MIX **PCA #:**

Sample #		VLP	EMON Staff: Treatment/Contractor Name

Date (Sample On) Month	Day	Year	Time On Hour	Min	Street: County:	Treated Site
					City: , CA ZIP:	Y / N
					Tank #	
Day					SS / Poly / FG	
Time					_____ gal.	
Mix					open / covered	
Water						
A.I.						

Sample from - Tank / Gun / Hose Mix time _____ min
~ Volume in tank _____ gal
_____ Treated property of the day (After lunch? _____)
# of trees _____
Volume Used During Treatment _____
Treatment Start Time: End Time:

Laboratory Number

Laboratory Results Section
Lab results relate only to the sample tested

	Check request	Amount Detected	Detection Level	Method/Comment
Carbaryl	☐			
Cyfluthrin	☐			
Bifenthrin	☐			
Imidacloprid	☐			
Permethrin	☐			
Diflubenzuron	☐			
Pesticide Screen	☐			
Others	☐			
	☐			

Sample Type:
☐ Water #_____
☐ Soil #_____
☐ Tank Mix #_____
☐ Foliage _____
☐ Air/Deposition/others _____

1. Sampler		Extracted by:	Date
2. Relinquished samples after transport	Date	Analyzed by:	Date
3. Received samples	Date	Confirmed by:	Date
4. Released to CDFA by	Date	Approved by:	Date
5. Received at lab by	Date	Logged in by lab	Date/Time
6.	Date		

7/14/2020

Lab report page____of____