

The Pesticide Label

Key to Pesticide Safety and Education

October 2004–February 2005

Department of Plant and Environmental Protection Sciences

Contents

	Page
Regulatory Updates	2
Hawaii’s Pesticide Rules Reviewed	3
Illegal Use of Sodium Cyanide	6
EPA’s Statement On Pesticide Treatments In, On or Near Water	7
A Mothball Mishap (Recertification Topic)	8
Precautions for Combining Pesticides in a Tank Mix (Recertification Topic)	9
Jar Test for Compatibility of Pesticide Mixtures (Recertification Topic)	11
Spray Adjuvants (Recertification Topic)	12
Pest Management Publications from CTAHR	16
Kauai Short Course for Pesticide Handlers	18
Weed Management Slide Shows On-line	19

Staff’s Notes

The Hawaii Department of Agriculture is in the early stage of proposing changes to its rules on restricted use pesticide certification fees, recordkeeping, and other issues important to pesticide applicators and distributors. For details, see the article on page 3 “Hawaii’s Pesticide Rules Reviewed.”

The October 2004 flood in Manoa valley came through our office. It left us without the electricity and working space to get our newsletter finished and mailed in December. The issue you’re reading now is late because of that. And it prompts us to send this reminder—If you store pesticides in areas prone to flooding, get them up off the ground. Water, mud, and rot can scatter and ruin things in hard-to-imagine ways.

Aloha,

Charles Nagamine, Instructor
Pesticide Risk Reduction Education Program

THIS NEWSLETTER IS SUPPORTED IN PART BY THE STATE OF HAWAII DEPARTMENT OF AGRICULTURE.

Regulatory Updates

We listed Special Local Need (SLN) labeling in previous issues of this newsletter. Here is an update.

You may use the items in this article to update the leaflet *List of Special Local Need Labelings for Pesticides in Hawaii as of Nov. 1, 2002*. The leaflet is available from the Internet at <http://pesticides.hawaii.edu>.

A current list of Hawaii's Special Local Need Labeling may be viewed on the Internet at the Hawaii Department of Agriculture's webpage, www.hawaiiag.org/hdoa/pi_pest_list.htm. The list is updated once a month. To download and view the list, click on the second link **List of current Hawaii special local needs registered pesticides [sln.pdf]**

NEW OR RENEWED

For growers of **macadamia**—use of the pesticide **Ethrel® Ethephon Plant Regulator for Pineapple and Sugarcane** (Bayer CropScience; EPA Reg. No. 264-257)—requires having a copy of **HI-840004**, valid 9/7/2004–9/6/2009—some notes: • Do not apply to diseased, low vigor or moisture stressed trees. • Use only one (1) spray per season. • Do not apply within 5 days of harvest. • Do not graze or feed cover crops. • Mix only the amount to be used that day. • This is an agricultural use pesticide and so the Worker Protection Standard applies.

For growers of **dasheen (taro) leaves (leaf production only)**—use of the pesticide **Provado® 1.6 Flowable** (Bayer CropScience; EPA Reg. No. 264-763)—requires having a copy of **HI-040003**, valid 9/8/2004–7/4/2007—some notes: • 7 days to harvest. • Allow at least 7 days between foliar applications. • Do not harvest corms for food or feed. • Do not apply directly to water or to areas where surface water is present. • For applications in wetland production, fields must be drained prior to application. • Allow at least 5 days between foliar applications. • Do not apply more than 18.75 fluid ounces of Provado 1.6 Flowable per year as foliar sprays. • Regardless of formulation or type of application (soil or foliar), do not apply more than a total of 0.5 lb. active ingredient of ADMIRE [insecticide] or PROVADO [insecticide] per acre per season. • This is an agricultural use pesticide so the Worker Protection Standard applies.

For growers of **banana**—use of the pesticide **Nemacur® 15% Granular Systemic Insecticide-Nematicide** (Bayer CropScience; EPA Reg. No. 264-726)—requires having a copy of **HI-040002**, valid 6/8/2004–6/4/2007—some notes: • 15 days to harvest. • Apply as a band application with ground equipment. • Application must immediately be followed by incorporation. • Do not apply during drought or the dry season unless crop is being irrigated. • Do not apply with backpack type equipment. • This is a restricted use pesticide. • This is an agricultural use pesticide so the Worker Protection Standard applies.

For growers of **banana**—use of the pesticide **Nemacur® 3 Emulsifiable Systemic Insecticide-Nematicide** (Bayer CropScience; EPA Reg. No. 264-731)—requires having a copy of **HI-040001**, valid 9/8/2004–6/4/2007—some notes: • Band application with ground equipment must immediately be followed by incorporation. • Do not apply product in less than a 4-foot total band width. • Do not apply with backpack type equipment. • 15 days to harvest. • Application through “Low Pressure Irrigation” allowed; minimum and maximum dosage per acre per year are specified; refer to product label for details such as requirements for back-flow prevention system and posting signs around treated areas. • This is a restricted use pesticide. • This is an agricultural use pesticide so the Worker Protection Standard applies.

CANCELLED

Regarding treatment of **cucumber, melon, squash, and pumpkin** with **Gramaxone® MAX**—SLN labeling HI-020007 replaces cancelled SLN labeling HI 010002. (This action accommodates a change in the product's EPA registration number.)

Regarding treatment of **macadamia nut orchards** with **Gramaxone® MAX**—SLN labeling H-020008 replaces cancelled SLN labeling HI-010003. (This action accommodates a change in the product's EPA registration number.)

Regarding treatment of **tropical fruit/nut orchards** with **Siege® PRO** in bait stations—HI-020003 was cancelled. The same use has been added to the label on newer containers of the product.

Regarding treatment of **tropical fruit/nut orchards** with **Amdro® PRO**—SLN labeling HI-020009 was cancelled. The same use has been added to the label on newer containers of the product.

Regarding treatment of **macadamia orchards** with **Ramik® Mini Bars**—SLN labeling HI-980006 is classified “restricted use” (effective 11/15/2004). This action only applies to application of the product and other handling procedures covered by this SLN labeling and by the label on the product's container. This means that a **certified applicator** must make the treatments and that **recordkeeping** for restricted use pesticides is required. “Sale and distribution” are unaffected by this action.

Source: Pesticides Branch, Hawaii Department of Agriculture.

* * *

Hawaii's Pesticide Rules Reviewed

Rules regulating sale and use of pesticides in Hawaii have been reviewed by the Governor's Pesticides Advisory Committee, which advises the State of Hawaii Department of Agriculture. The committee recommended changing some parts of Hawaii's 1987 pesticide rules. The rules with recommended changes now must go through a public hearing process and be approved by the governor before any of the recommended changes can be applied to pesticide users and distributors.

The process leading up to public hearings is itself lengthy, making it unlikely that hearings will take place in early 2005. Prior to scheduling public hearings, the state Attorney General's office and the Governor must review the recommended rule changes. The process is structured to ensure legitimate public hearings. The Hawaii Department of Agriculture will announce its public hearing schedule via its web site, www.hawaiiag.org/hdoa/publicnotices.htm.

The pesticide rules are part of a much larger set of rules called the “Hawaii Administrative Rules” or “HAR,” which establishes guidelines and limits for specific types of actions that the State of Hawaii's government agencies may take when carrying out their functions. When regulating pesticide sale and use, the actions of the Hawaii Department of Agriculture are guided by **Chapter 66** of Title 4 of the Hawaii Administrative Rules. The current version of Chapter 66 is posted on the Internet at www.hawaiiag.org/hdoa/

continued on page 4

adminrules.htm. (Click on the phrase, "AR- 66.PDF" in the right column to download the PDF file.)

Summary of Recommended Changes

The following paragraphs were extracted from a report, *Annual Report Narrative, Fiscal Year 2004, Pesticides Branch*, by Robert Boesch, Pesticides Branch Manager.

The Advisory Committee on Pesticides and subcommittees on ground water review and notification met during fiscal year 2004 and made recommendations on revising the pesticides rules (Title 4, Subtitle 6, Chapter 66, Hawaii Administrative Rules or 4-6-66, HAR). Among the revisions are the following:

- The following definitions are proposed to be added to 4-66-2, HAR: "Licensed pesticide dealer representative," "private applicator," "public indoor area," "public outdoor area," " under the direct supervision of a certified applicator," and "unreasonable adverse effects on the environment."
- 4-66-25, HAR, concerning labeling for pesticides classified for general use is proposed to be repealed since EPA does not use the general use classification.
- 4-66-32, HAR, concerning restricted use pesticides, changes are proposed to add criteria for restricted-use classification, including contamination of ground water and pesticide uses authorized by an emergency exemption issued by EPA. The pesticides proposed for restricted-use are: alachlor, atrazine, bromacil, chlorine gas, Chloropicrin (including its use as a warning agent when used with any pesticide), cyanazine, hexazinone, metolachlor and its isomers, paraquat, picloram and simazine. Many pesticides are being removed from the list, most of which are no longer being manufactured.
- A new section is proposed to add a procedure to evaluate pesticides uses.
- 4-66-34, HAR, concerning application procedures for pesticides, changes are proposed to add procedures for the review of non-chemical pest control devices.
- 4-66-42, HAR, concerning coloration of pesticides is proposed for overhaul, to repeal parts related to the coloration of pesticides that are no longer manufactured and replace it with standards for seed treatment products.
- 4-66-52, HAR, concerning restricted use pesticide dealers proposals are to require dealers to notify the department when changes in personnel responsible for restricted use pesticides sales occur, and to have the license for personnel responsible for restricted use pesticides sales expire in 5 years, with renewal by examination.
- 4-66-53, HAR, concerning dealer's records and reports changes are proposed to track all transactions effecting the inventory of restricted use pesticides, not just sales;

- 4-66-55, HAR, concerning disposal of pesticides containers is being revised to refer to the Department of Health's requirements concerning management of solid and hazardous wastes and to eliminate burial on-site as an option for disposal.
- 4-66-56, HAR, concerning certification of applicators, changes are proposed:
 - To repeal the seed treatment pest control category since there are no applicators certified in this category, and move aerial pest control to this subparagraph;
 - To repeal the home pest control category, since chlordane and heptachlor are no longer used for termite pest control and replace it with a specialty category for single pesticides such as chlorine gas, tributyltin paints, and metam-sodium used for root control in sewer pipelines;
 - To move private applicator certification to the end of this section and include subcategories for agricultural fumigation and agricultural chemigation.
- 4-66-57 and 58, HAR, concerning general and specific standards for certification of applicators, changes are proposed to establish a minimum age for certification at 18 years old and make other amendments for consistency with other sections.
- 4-66-59, HAR, concerning standards for certification of private applicators is proposed to be repealed since the new sections 4-66-56, 57 and 58 cover private applicators.
- 4-66-60, HAR, concerning certification procedures is proposed to be amended to be more comprehensive in including the precise procedures for certification and recertification, including the number of hours of education credit that must be earned in the five (5) year certification period to be renewed without examination. This section also establishes procedures for approval of classes for certification credit and issuing replacement certificates.
- 4-66-62, HAR, concerning certified pesticide applicator record keeping requirements have been amended to require commercial and private applicator records to be kept and to require commercial applicators to provide agricultural employers with information required by the EPA's Worker Protection Standard.
- 4-66-63, concerning single purchase certification is being repealed since it is no longer necessary for residential use of termiticides, such as chlordane, which have been cancelled.
- A new section concerning annual use permits is proposed for pesticides if existing controls are inadequate to prevent unreasonable adverse effects to humans or the environment.
- 4-66-65, concerning posting of signs is being repealed.
- 4-66-66, concerning fees, is being amended to increase fees as follows:
 - Product licenses: \$225 for three years;

continued on page 6

- Restricted pesticides dealer principal sales outlet: \$250 per year;
 - Restricted pesticides dealer branch location: \$100 per year.
 - Applicator examination fee: \$25
 - Replacement certification card: \$25
 - Applicator certification or licensed restricted pesticide dealer representative fee: \$50.00 for five years
 - Applicator certification or licensed restricted pesticide dealer representative renewal fee: \$50.00 for five years.
- A new section on proposed enforcement penalty guidelines is proposed which the Department in proposing license or certificate suspensions and monetary penalties will use.

* * *

Illegal Use of Sodium Cyanide

December 2, 2004

“Wax moth” includes both the greater wax moth, *Galleria mellonella*, and the lesser wax moth, *Achroia grissella*. Both are sometimes referred to the “wax wing moth.” The larvae of these moths damage or destroy honeybee combs by boring through the cells as they feed on the honeybees’ cocoons, cast skins, and stored pollen. As they chew through the wax, they spin silken webbing for protection. Infested combs are often reduced to a mass of webbing and debris.

The United States Environmental Protection Agency (EPA) and state departments of agriculture have recently been alerted that some beekeepers have been using **sodium cyanide** compound to control pests in their honey bee colonies/hives. Specifically, apiarists have been purchasing and using a sodium cyanide compound as a fumigant in beehives to destroy or mitigate wax moths including the caterpillar and larvae, as well as to cull out weaker hives. These practices are illegal and have the potential for serious harm to human health and the environment.

All pesticides distributed in the United States must be registered by the EPA. The Federal pesticide law defines “pesticide” to include any substance intended for controlling, mitigating or destroying pests. A substance is a pesticide and requires registration as such if the person distributing the substance (1) makes claims, either expressed or implied, that the substance can be used as a pesticide or (2) distributes the substance with the knowledge that the substance will be used to control pests. Any individual selling or distributing sodium cyanide compound for mitigating any pest, including the wax moth, caterpillar and larvae, or any other pest for use in bee hives or colonies is selling and distributing an unregistered pesticide and subject to penalties of up to \$6,500 per violation under FIFRA.

Currently, there are no sodium cyanide or similar cyanide compound products registered by the EPA for pest control in honey bee colonies/hives. Also, there are no established residue tolerances for any cyanide compound in honey or beeswax. Honey analyzed and found to contain any cyanide compound residue would be considered adulterated under the Federal Food, Drug and Cosmetic Act, and could be seized. The seizure of honey due to adulteration with a highly toxic chemical would be detrimental to the entire apiary industry.

Further, use of sodium cyanide in an apiary setting can be extremely dangerous. The compound is highly toxic to humans and other warm-blooded animals, and it is a toxicity category I compound—EPA’s highest toxicity level for pesticides. This rating indicates the greatest degree of acute toxicity for oral, dermal, and inhalation effects. It is highly corrosive to the skin and

eyes. Cyanide can be absorbed through the skin and its vapor is absorbed extremely rapidly via the respiratory tract.

Beekeepers who are currently in possession of the highly toxic, unregistered sodium cyanide compound or related products should contact their state agricultural agency for instructions on proper storage and disposal of the product. The state agricultural agency can also provide information on registered pesticides, such as paradichlorobenzene and aluminum phosphide products, that are legal to use to mitigate pests in honey bee colonies/hives.

Source: US Environmental Protection Agency, Office of Pesticide Programs, "Sodium Cyanide information sheet" dated 12/2/04.

* * *

EPA's Statement on Pesticide Treatments In, On, or Near Water

Waters of the United States include essentially all surface waters such as navigable waters and their tributaries, interstate waters and their tributaries, most natural lakes, wetlands adjacent to these waters, and impoundments of these waters. This may include lakes, rivers, streams (including intermittent and ephemeral streams), natural ponds, mudflats, playa lakes, sloughs, wet meadows, swamps, bottomland hardwood wetlands, and other kinds of watercourses, wetlands, and aquatic areas. (From the web page the US Department of Agriculture, Natural Resources Conservation Service, titled "Waters of the U.S." viewed 2/4/05 at http://policy.nrcs.usda.gov/scripts/lpsiis.dll/H/H_190_610_F_82.htm)

On August 13, 2003, the US Environmental Protection Agency (EPA) published a notice in the Federal Register soliciting public comment on an Interim Statement and Guidance to address issues pertaining to coverage under the **Clean Water Act (CWA)** of pesticides regulated under the **Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)** that are applied to or over waters of the United States. (See note in sidebar: "Waters of the United States.") The interpretation addressed two sets of circumstances for which EPA has determined that the application of a pesticide to waters of the United States consistent with all relevant requirements of FIFRA does not constitute the discharge of a **pollutant** that requires a **National Pollutant Discharge Elimination System (NPDES) permit** under the CWA. On February 1, 2005, EPA released an interpretive statement developed after consideration of the public comments, and proposed to revise the NPDES permit program regulations to include the substance of the interpretive statement.

BACKGROUND: Judicial rulings stemming from two lawsuits in 2001 and 2002 raised the question about the need for NPDES permits. The lawsuits were about pesticide treatments involving the release of herbicide-treated canal water into a stream and aerial spraying for forest insects. The rulings prompted EPA to issue its 2003 "Interim Statement and Guidance" in order clarify that no NPDES permits were necessary. EPA also invited public comment on the Interim Statement and Guidance. EPA followed up on February 1, 2005 with the statement and proposed regulation change, as described above.

Details of EPA's statement and proposed regulation change were published in the Federal Register, February 1, 2005 (Volume 70, Number 20, pp. 5093-5100), "Application of Pesticides to Waters of the United States in Compliance With FIFRA."

Source: Federal Register: February 1, 2005 (Volume 70, Number 20), Proposed Rules, pp. 5093-5100.

* * *

RECERTIFICATION CREDITS may be earned by certified applicators (except those in *commercial* categories 8 and 10) who take advantage of any "recertification topic" article in this newsletter.

To earn credit(s) for an article, an applicator must correctly answer at least 70% of the evaluation questions prepared by the Hawaii Department of Agriculture staff. For more information, telephone one of these HDOA offices: Oahu 973-9404 or 973-9424, Maui 873-3960, Hawaii 974-4143. The area code for all offices is 808.

A Mothball Mishap (Recertification Topic)

1-800-222-1222 is the telephone number for the Rocky Mountain Poison & Drug Center. It is one of the oldest poison control centers and has been in operation since 1956. The Rocky Mountain Poison & Drug Center is certified as a regional poison center by the American Association of Poison Control Centers. Its service area encompasses Colorado, Montana, Idaho, **Hawaii** and southern Nevada, though physician phone consultations can extend nationwide. The Rocky Mountain Poison and Drug Center is an agency of the Denver Health and Hospital Authority (Denver Health). <http://debian-bsd.lightbearer.com/publicinfo/index.cfm>.

*The following description of a poisoning is provided by the National Pesticide Information Center (NPIC), a cooperative effort of Oregon State University and the US Environmental Protection Agency. Contact NPIC if you have a question about pesticides or want to learn more: telephone 1-800-858-7378, email npic@ace.orst.edu, Internet <http://npic.orst.edu/index.html>. **For emergency medical treatment information, Hawaii residents may call the Rocky Mountain Poison & Drug Center, 1-800-222-1222.***

Lately, Derik has seen a couple of rats in his basement and has heard them running around in his attic during the nighttime. Derik's neighbor advised him to use mothballs to control the rats. As a result, Derik purchased several boxes of mothballs and then scattered them in his basement and attic. The next morning, Derik's wife, Beverly, woke up and noticed an unusual odor in the house. She told Derik about her concerns the following day when the odor was so strong it was difficult for her to breathe. Subsequently, she developed a headache that would not go away. Beverly contacted her local Poison Control Center for emergency medical treatment information. Next, she called National Pesticide Information Center (NPIC) because she wanted to find out how to reduce the odor in their house.

Take Home Message

Beverly learned that their situation could have been avoided if Derik read and followed the label directions on the mothball products, instead of listening to what his neighbor said. The NPIC Specialist discussed with Beverly that the product Derik used was not registered by the Environmental Protection Agency to repel or kill rats. Rather, it was intended to kill clothes moths and their eggs and be used only in garment bags, storage closets, and airtight containers. Beverly learned that mothballs are pesticides that come in a solid form, but they volatilize—changing slowly into a gas. Mothballs produced in the U.S. contain one of two active ingredient chemicals: naphthalene or paradichlorobenzene. Exposure to large quantities of naphthalene or paradichlorobenzene can lead to headaches, confusion, excitement or depression, and nose, throat, and lung irritation. Furthermore, if exposed for an extended duration, naphthalene or paradichlorobenzene can lead to liver and kidney damage. Beverly was interested in learning how she could reduce the gas the mothballs were producing in their home. The NPIC Specialist discussed a number of steps she could consider, including removing the mothballs and ventilating by opening the doors and windows. The label directions instruct users to avoid skin contact with the mothballs. Therefore, it is important that Beverly wear gloves when removing them. To reduce further exposure, Beverly and Derik could leave their home while ventilating

and, if needed, use a fan to increase the air circulation. Instructions on how to properly dispose of the mothballs can be found on the label or be provided by contacting a local household hazardous waste program. The NPIC Specialist reminded Beverly to always “Read the Label First” before using a pesticide product in order to determine where it can be used, what pests the product will control, and how to use it correctly.

* * *

Precautions for Combining Pesticides in a Tank Mix (Recertification Topic)

Many pesticides are made to be diluted with water (or some other liquid) and then applied as a spray to a crop, animal, site, or object. The resulting diluted mix is often called a *tank mix*. This article is about making a tank mix with two or more pesticides.

Tank Mix Components

The *diluent* (said “dill–you–went”) is the liquid used to dilute the pesticide. Water is a common diluent. If the tank mix will be used for treating plants or crop fields, a water–fertilizer solution is sometimes used as a diluent.

Another pesticide might be added to the tank mix. But before combining two or more pesticides in a tank mix, the pesticide user must ensure that none of the pesticide labeling prohibit the combination.

One or more *adjuvants* (said “aj–uh–vent”) might be added to the tank mix. Adjuvants are liquid chemicals made to improve mixing and application, or to improve the tank mix’s effectiveness. Common types of adjuvants are:

- Surfactant (short for “surface active agent”)
- Sticker
- Spreader–sticker
- Extender
- Activator
- Compatibility agent
- Buffer
- Acidifier
- Deposition aid
- Defoamer
- Thickener
- Attractant

Adjuvants are not regulated as pesticides. But if a pesticide’s labeling *requires* the addition of a specific adjuvant product or a general type of adjuvant, then the adjuvant must be used. This kind of requirement is rare though, because many pesticides made for tank-mixing already contain an adjuvant.

continued on page 10

Benefits and Risks

Applying one tank mix of two or more pesticides has several benefits (compared to applying each pesticide separately):

- Allows control of more types of pests
- Requires less labor
- Causes less compaction of soil that must bear the weight of the equipment
- Causes less wear to the equipment
- Uses less fuel

But applying an unproven tank mix of any two pesticides is often riskier than separate applications, when considering:

- *Phytotoxicity*, the ability of the tank mix (or any chemical) to kill, stunt, discolor, or otherwise harm the plants to be protected. This is possible even if each pesticide applied in separate a operation would not be phytotoxic.
- Clogging of application equipment. If any two components of the tank mix are *incompatible*, they could react with each other and separate from the liquid portion of the tank mix, forming a sludge, gel, crystals, flakes, or an oily or greasy substance.
- *Antagonistic* effects. One or all of the incompatible chemicals in a tank mix may lessen the effectiveness of the pesticide(s). Water alone may ruin the tank mix if it is either too acidic or too basic.

Considerations and Planning

Pesticide labeling restrictions—Review the labeling of all pesticides to be used in a tank mix. Be sure that none of them prohibit use in combination with another product. If any of the labeling prohibits the combination, using the tank mix would considered a “misuse” of the pesticide (and therefore illegal). If the labeling say nothing about tank-mixing—neither giving instructions for nor prohibiting tank-mixing, then tank-mixing would generally not be a misuse.

Diluents allowed—If a pesticide’s labeling specifies a certain substance as a diluent, using any other substance is a misuse. If no particular substance is specified as the diluent, only water may be used.

Waiting period after treatment—If the tank mix is for treating a food or beverage crop, learn the *pre-harvest interval* (PHI) for all pesticides in the tank mix and plan to harvest only after the longest PHI. For example, if the PHI is 10 days for one pesticide and 21 days for the other, plan to delay harvesting until 22 days after the treatment. Apply the same rule for treating a pasture to be grazed, meat animals to be slaughtered, dairy animals producing milk, and birds producing eggs.

If the tank mix is for treating plants grown in nurseries, greenhouses, farms, or commercial forests, learn the *restricted entry interval* (REI) for

each pesticide in the mix and schedule worker re-entry into the treated field according to the longest REI.

Precautions and Tests

Because it's impractical for pesticide manufacturers to test every possible combination of tank mix components under all conditions, pest managers should take some precautions of their own before making a full-scale treatment. The idea is to prove the compatibility of a particular combination of tank mix components. This is advised even if the pesticide labeling either gives instructions for tank-mixing or says nothing about tank-mixing.

Jar test—Do a jar test to see if a particular combination of tank mix components might separate in the sprayer tank. Use the procedure described by the labeling or try the one described in the article “Jar Test for Compatibility of Pesticide Mixtures” in this newsletter.

Small-scale test—Apply a small batch of tank mix to a sample of the plants, objects, or site to be treated. Watch the treated sample for signs of undesirable effects for an appropriate period of time. Also be aware that if air temperature or humidity is different during a full-scale treatment, plants may react differently.

Sources

Pesticide Interactions (4/1/98), in the on-line magazine *Grounds Maintenance*, last viewed 2/14/05, at http://grounds-mag.com/mag/grounds_maintenance_pesticide_interactions/.

HOW TO: Check for tank mix compatibility (1/1/2001), in the on-line magazine *Grounds Maintenance*, last viewed 2/14/05, at http://grounds-mag.com/mag/grounds_maintenance_pesticide_interactions/.

R.K. Zollinger, North Dakota State University, Extension Service. “PESTICIDE COMBINATIONS”, Section A12, in 1999 North Dakota Weed Control Guide, last viewed 2/14/05 at www.ext.nodak.edu/extpubs/plantsci/weeds/w253/w253g06.htm.

P.J. Marer. University of California, Davis. Chapter 4: Pesticides, in *Safe and Effective Use of Pesticides* (Publication 3324), 1998.

* * *

Jar Test for Compatibility of Pesticide Mixtures (Recertification Topic)

Always wear personal protective equipment when pouring or mixing pesticides, even for this simple test.

To conduct a jar test, add proportionate amounts of all the products you intend to mix in the spray tank to a clear quart jar. When using a liquid fertilizer carrier [as the diluent], many herbicide labels recommend using two jars for this test—one with and one without a compatibility agent.

Step 1. Measure 1 pint of water (or carrier solution) into a clear quart jar. Use the same water source that will be used in the tank mix.

Step 2. Add proportionate amounts of each product, one at a time, in the order suggested on the label, or add ingredients in the following order. (Stir each time a formulation has been added.)

1. Compatibility, buffering, or defoaming agents
2. Wettable powders, dry flowables, and water-dispersible granule products
3. Flowable and microencapsulated products

continued on page 12

4. Emulsifiable concentrates
5. Solutions or soluble powder products
6. Remaining adjuvants (crop oils, surfactants)

Step 3. Shake the jar vigorously and allow it to stand for at least 15 minutes. The mixture is probably not compatible if scum forms on the surface, the mixture clumps, or any solids settle to the bottom (except for wettable powders). Do not use a mixture that gives off heat (determined by feeling the jar) as that indicates a chemical reaction has occurred and changed the chemical properties of the products.

If a compatibility problem occurs, dispose of the mixture according to the pesticide product label. Finally, if no signs of incompatibility appear, put the pesticide test mixture into the spray tank. In addition, rinse all utensils and pour the rinse water (rinsate) into the spray tank and apply to a labeled site. Do not use utensils or jars for any other purpose after they have contacted pesticides.

Source: The leaflet *Spray Adjuvants*, 2004, in the series *Pesticide Safety Fact Sheets*, by the Pesticide Education Program, College of Agricultural Sciences, The Pennsylvania State University, www.pested.psu.edu/resources/facts/, last viewed 2/7/05.

* * *

Spray Adjuvants (Recertification Topic)

The text of this article comes from the leaflet "Spray Adjuvants" (2004), one of a series of pesticide safety fact sheets produced by the College of Agricultural Sciences at The Pennsylvania State University. www.pested.psu.edu/resources/facts/.

The agricultural and horticultural industries are being overwhelmed by adjuvant choices. With so many products to choose from, how do you make an informed decision about which adjuvant to use in a particular situation? A good place to start is to examine the characteristics of this diverse group of chemicals. An adjuvant is broadly defined as any nonpesticide material added to a pesticide product or pesticide spray mixture to enhance the pesticide's performance and/or the physical properties of the spray mixture. The right adjuvant may reduce or even eliminate spray application problems, thereby improving overall pesticide efficacy. Because adjuvants themselves have no pesticidal properties, they are not required to be registered by the US Environmental Protection Agency (EPA). Additionally, most states do not regulate the distribution of adjuvants.

Before using any adjuvant, you should consult the pesticide's label. Many EPA-registered pesticide products have very specific recommendations on their labels about using one or more adjuvants. Failure to follow these instructions is a violation of the product label and considered an inappropriate use of the pesticide.

Questions about the specific properties of an adjuvant or pesticide product should be referred to the manufacturer before you attempt to use the product. Manufacturers can provide labels, technical data sheets, material safety data sheets (MSDS), supplemental labeling, and promotional literature about their products.

The two types of adjuvants are distinguished by how they are combined with the pesticide. A *formulation adjuvant* is already included in the

pesticide product by the manufacturer. A *spray adjuvant* is a separate product that is added to the spray tank by the applicator. Since applicators have no control over formulation adjuvants, this publication focuses on spray adjuvants.

Adjuvants and Spray Application

Some research indicates that up to 70 percent of the effectiveness of a pesticide depends on the spray application. However, spray application is perhaps the weakest link in the pesticide development process. Therefore, the ability to use adjuvants to minimize or eliminate many spray application problems will help boost the pesticide's effectiveness.

Adjuvants are designed to perform specific functions, including buffering, dispersing, emulsifying, spreading, sticking, and wetting. Adjuvants also can reduce evaporation, foaming, spray drift, and volatilization. No single adjuvant can perform all these functions, but different compatible adjuvants often can be combined to perform multiple functions simultaneously.

Spray adjuvants can be categorized into two groups: activator adjuvants and special-purpose or utility adjuvants.

Activator adjuvants

The primary purpose of activator adjuvants is to enhance the *activity* of the pesticide product. These enhancements—both physical and chemical—generally lead to improved absorption and, as a result, a more efficient use of the pesticide. Activator adjuvants include surfactants, oils, and nitrogen-based fertilizers.

Surfactants

Surfactants (surface acting agents), also called wetting agents and spreaders, physically alter the surface tension of a spray droplet. For a pesticide to perform its function properly on a plant, the spray droplet must be able to wet the foliage and spread out evenly. Surfactants enlarge the area of pesticide coverage, thereby increasing the pest's exposure to the chemical (see Figure 1). Surfactants are particularly important when applying a pesticide to a plant with waxy or hairy leaves. Without proper wetting and spreading, spray droplets often run off or fail to adequately cover these surfaces. Too much surfactant, however, can cause excessive runoff or deposit loss, in turn reducing pesticide efficacy. Surfactants are classified by the way they ionize, or split apart, into electrically charged atoms or molecules called ions. A surfactant with a negative charge is *anionic*, one with a positive charge is *cationic*, and one with no electrical charge is *nonionic*. Pesticidal activity in the presence of a nonionic surfactant can be quite different from activity in the presence of a cationic or anionic surfactant.

continued on page 14

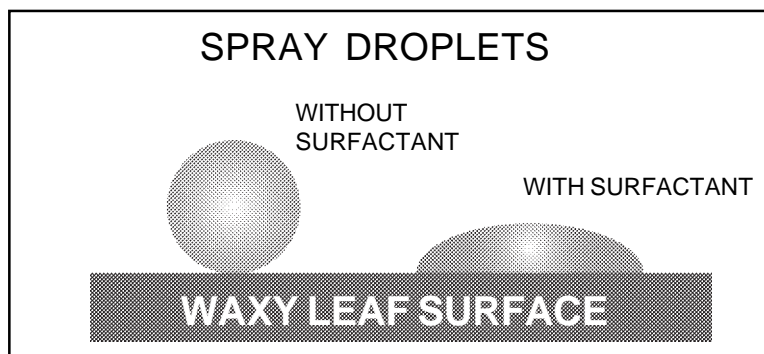


Figure 1. Surfactant enlarges area covered by pesticide spray droplets.

Selecting the wrong surfactant can reduce the efficacy of a pesticide product and increase the risk of plant injury. Anionic surfactants are most effective when used with contact pesticides. Cationic surfactants should never be used as stand-alone surfactants because they usually are *phytotoxic* (poisonous to plants). Nonionic surfactants are often used with systemic pesticides and help pesticide sprays penetrate plant surfaces. Furthermore, nonionic surfactants are compatible with most pesticides, and most EPA-registered pesticides that require a surfactant recommend a nonionic type.

Organo-silicone surfactants are a newer group of surfactants that are taking the place of the more traditional nonionic surfactants. They have the ability to reduce surface tension, increase spreading ability and improve rain fastness (the amount of time between a pesticide application and rainfall). Rain fastness can be improved, or shortened, when pesticide absorption into the plant is increased.

Oils

Oils are being used to control grassy weeds. The three types of oil-based adjuvants include crop oils, crop oil concentrates, and vegetable oil concentrates.

Crop oil is generally 95 to 98 percent paraffin or naphtha-based petroleum oil with 1 to 2 percent surfactant/emulsifier. Crop oils promote the penetration of a pesticide spray either through a plant's waxy surface or through an insect's tough, chitinous skin. Traditional crop oils are more commonly used for insect and disease control and rarely with herbicides.

Crop oil concentrates (COC) consist of 80 to 85 percent emulsifiable petroleum-based oil and 15 to 20 percent nonionic surfactant. Crop oil concentrates provide the penetration properties of oil and the spreading properties of a surfactant. COC's are often used with postemergence herbicides.

Vegetable oil concentrates (VOC) consist of 80 to 85 percent crop-derived seed oil (usually cotton, linseed, soybean, or sunflower oil) and 15 to 20 percent nonionic surfactant. To improve their performance, many VOC's have undergone a process called *esterification*, which increases

the oil-loving characteristics of the seed oil and results in a *methylated seed oil* (MSO). MSO's are comparable in performance to traditional crop oil concentrates in that they increase penetration of the pesticide into the target pest.

Nitrogen-based fertilizers

Enhanced herbicide activity has been shown by adding ammonium sulfate or urea-ammonium nitrate to the spray mixture. Nitrogen fertilizers may replace some adjuvants but are usually added in addition to a surfactant and a crop oil concentrate for use with systemic pesticide products. Many fertilizer-based adjuvants are available in liquid forms, which are easier to mix and provide more consistent results. Fertilizers should only be used with herbicides when indicated on the label.

Special purpose/utility adjuvants
Special purpose adjuvants correct specific conditions that can adversely affect the spray mixture or the actual application of the pesticide. By controlling these factors, you can maximize the efficient use of the pesticide. The following adjuvants modify the physical characteristics of the spray solution and include compatibility agents, buffering and conditioning agents, defoaming agents, deposition agents, and drift control agents and thickeners. Carefully follow product label directions before adding any adjuvant to a spray mix.

Compatibility agents

Pesticides are commonly combined with liquid fertilizers or other pesticides. However, some combinations can be physically or chemically incompatible, causing clumps and uneven distribution in the spray tank. Occasionally, the incompatible mixture will clog the pump and distribution lines, resulting in expensive cleanup and repairs. Using a compatibility agent may eliminate these problems. A "jar test" can help determine the stability of the mixture. (See panel.)

How to Choose the Right Adjuvant

Many factors must be considered when choosing an adjuvant for use in a pest management program. The following are some guidelines:

- First and foremost, *read the pesticide label*.
- Use only adjuvants manufactured and marketed for agricultural or horticultural uses. Do not use industrial products or household detergents with pesticides because they may interfere with pesticide performance.
- Pesticide labels seldom mention specific brands of adjuvants, but rather the general type of adjuvant, such as nonionic surfactant, crop oil, or defoaming agent. However, if the pesticide label lists a specific brand of adjuvant, that brand should be used.
- Miracle adjuvants do not exist. Ignore claims such as "keeps spray equipment clean," or "causes better root penetration." Always buy recognizable, name-brand products from a reputable dealer.

continued on page 16

- Adjuvant recommendations may change due to changes in pesticide formulations, newly labeled tank mixes and premixes, and changes in application technology and procedures. Always read the label *every time* a pesticide product is used.
- Using an adjuvant is not always necessary. Knowing when not to use an adjuvant is just as important as knowing when to use one. If the pesticide label does not mention an adjuvant, the manufacturer's research probably has shown no benefits—or even adverse effects—from adjuvant use.

Spray adjuvants can contribute substantially to safe and effective pest control when used at the recommended rate on the label. Although a single adjuvant may perform more than one function, no single product can solve every problem. As a result, many spray adjuvants are available, each formulated to solve problems associated with a particular type of application. Read the pesticide label.

The correct use of adjuvants does require some knowledge of the site you plan to spray, the target pest, your equipment, and, of course, the pesticide you plan to use. By knowing the particular needs and limitations of the products you intend to use, adjuvants can prove to be a positive addition to the spray tank.

* * *

Pest Management Publications from CTAHR

The University of Hawaii's College of Tropical Agriculture and Human Resources released the following free publications. All may be viewed and downloaded from the Internet. Printed copies of some may be purchased from the College's Publications and Information Office. See details posted at www.ctahr.hawaii.edu/ctahr2001/PIO/FreePubs.asp, or inquire by calling 808-956-7038 or by emailing to ctahrpub@hawaii.edu.

Insect control chart, November 2004 [for greenhouse, nursery, and turf & landscape ornamentals], Publication IP-19—This chart lists insecticides (by active ingredient and brand name) that may be used for controlling insect pests of greenhouse, nursery, and turf & landscape ornamental plants. The list is arranged alphabetically by active ingredient. Brand names of insecticides containing the active ingredient are given. Effect of the insecticide on the pest is indicated by one of these ratings: E, effective; L, listed on the label; or S, suppression. Available in two sizes, 8½" by 11" and 11" by 17". Find the link for these charts on the Internet at www.ctahr.hawaii.edu/ctahr2001/PIO/FreePubs/FreePubs06.asp#InsectPests.

How to recognize symptoms of aster yellows in watercress, October 2004, Publication IP-20—This one-page chart is heavily illustrated with color photographs. It's arranged to allow easy comparison of infected and healthy watercress roots, shoots, leaves, and fields. Also shown are close-up photos of six weeds in which the disease-causing organism, a **phytoplasma**, may also infect and survive and the insect vector, **watercress**

leafhopper. Find link for this leaflet on the Internet at www.ctahr.hawaii.edu/ctahr2001/PIO/FreePubs/FreePubs06.asp#InsectPests.

Red imported fire ant: a seriously harmful potential invasive species, revised November 2004, Publication IP-3—This two-page illustrated leaflet should be read by managers of public and private property. The *red imported fire ant* (RIFA) is known throughout its present range on the mainland US and Puerto Rico for its aggressive habits and painful stings. It's not found in Hawaii but considering the volume of things imported from those regions, there is a chance that a RIFA colony may get a start here in Hawaii. The leaflet has photos of the RIFA and its mounds. It also describes the potential problems this ant may cause for native wildlife and people, particularly for human health, agriculture, recreation (on playgrounds, athletic fields, and golf courses), and property management (especially maintaining electrical, air conditioning, and traffic signal equipment). It also explains who to call to if a suspect ant mound is found. Find the link this leaflet on the Internet at www.ctahr.hawaii.edu/ctahr2001/PIO/FreePubs/FreePubs06.asp#InsectPests.

Plumeria in Hawaii, January 2005, Publication OF-31—This 57-page booklet is a culture guide for plumeria growers. The short section “Pests and Diseases” beginning on page 6 gives a brief description of a fungus disease of the leaves and insects that infest the leaves and stems. Most impressive though is the extensive display of photos and identifying features of Hawaii's cultivated varieties. Find this link for booklet on the Internet at <http://www.ctahr.hawaii.edu/ctahr2001/PIO/FreePubs/FreePubs07.asp#OrnamentalsAndFlowers>.

Control of Madagascar ragwort (aka Madagascar fireweed, *Senecio madagascariensis*), October 2004, Publication WC-2—This two-page leaflet has color photos and description of the weed. The section “Methods to control ragwort” discusses biological, cultural, and chemical control,” and concludes, “In general, a single herbicide application will not suppress Madagascar ragwort permanently. Cultural practices must be changed to prevent reinfestation.” Find this link for booklet on the Internet at www.ctahr.hawaii.edu/ctahr2001/PIO/FreePubs/FreePubs07.asp#OrnamentalsAndFlowers.

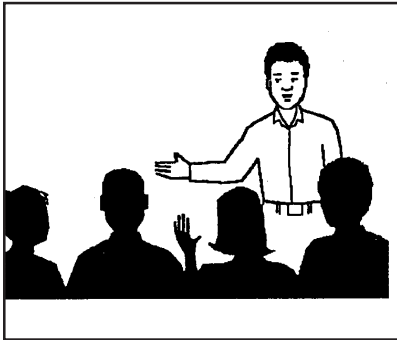
Series of 11 leaflets about **insect pests of livestock**, includes black & white photos of these flies, and their origin, public health concern, hosts, livestock concern, description, life cycle, and control: • Bronze bottle fly, LM-10.1 • Southern house mosquito, LM-10.2 • Horse bot fly, horse throat bot fly, LM-10.3 • Stable fly, LM-10.4 • Dog dung fly, LM-10.5 • Oriental blow fly, LM-10.6 • Soldier fly, LM-10.7 • Black dump fly, LM-10.8 • Lesser house fly, LM-10.9 • House fly, LM-10.10 • Horn fly, LM-10.11. Find this link for these leaflets on the Internet at www.ctahr.hawaii.edu/ctahr2001/PIO/FreePubs/FreePubs06.asp#LivestockManagement.

Mites on Ornamentals, December 2002, Publication MP-2—This three-page leaflet details useful information for managing eight groups of mites that feed on and damage ornamental plants. There is description of the visible signs of the damage they do to plants. This is most useful

because most of these mites are so small that some kind of magnifier is necessary to get a good look. Also described are their feeding, reproduction, and dispersal habits, and two beneficial organisms (“natural enemies”) that may keep pest mite populations in check.

* * *

Kauai Short Course for Pesticide Handlers



A *Pesticide Risk Reduction Education* short course will be offered in June on Kauai. The short course will benefit people who want to (1) be better informed about proper pesticide handling, or (2) prepare for the Hawaii Department of Agriculture’s certification exam for restricted use pesticides. (*Pesticides* includes insecticides, fungicides, herbicides, and rodenticides.) Previous trainees include owners, managers, supervisors, and pesticide buyers and applicators for these operations: farms, nurseries, commercial forestry, natural area conservation, botanical gardens, parks, landscaping, golf courses, hotels & resorts, and structural pest control. The 2½-day short course will be conducted by an instructor from the UH College of Tropical Agriculture and Human Resources.

Dates & Times

June 14, Tuesday, 12:30–4:00pm, and

June 15, Wednesday, 8:15am–4:00pm, and

June 16, Thursday, 8:15am–4:00pm.

Breaks are 50–60 minutes apart. Lunch breaks are 75 minutes.

Location

Kauai Community College, in Lihue

Topics—The instructor will emphasize the study packet’s “core” materials, which provide information common to all categories of certification. Topics include: • Types and formulations of pesticides • Pesticide labeling and MSDSs • Laws and regulations about buying, storing, transporting, applying, disposal, employee protection Integrated pest management basics & alternatives to pesticides • Common pests’ general identification features and life cycles • Common application equipment • Dilution and dosage calculations • Pesticide movement and breakdown • Groundwater protection • Endangered species protection • Carry-over, resistance, phytotoxicity • Hazards to pesticide handlers • Protective clothing and equipment • Safe mixing, loading, and application practices • Proper transport, storage, and disposal. The instructor will not cover the study packet’s “category-specific” materials, so you should study all of the material in the packet if you plan to take any of the certification exams.

Deadline for registration is **May 13**, Friday. The course will be postponed if less than 10 people have registered by this deadline. Enrollment will be limited to 25 people.

If you have a disability and may need accommodations to fully participate, contact the Agricultural Diagnostic Service Center (Honolulu), (808) 956-6706, by **May 13**.

Fee \$115, Includes classroom handouts and one complete packet of study material for the category you designate on your registration form; \$90 if you already have a current study packet. Details on registration form.

Registration Form Available from the instructor or this web site: <http://pestworld.stjohn.hawaii.edu/studypackets/ordrfrm3.html>.

Contacts: For questions about payment and receipts for registration and study packets, **Agricultural Diagnostic Service Center** (Honolulu), telephone 808 956 706, fax 808 956 9675, email adsc@ctahr.hawaii.edu. For questions about subject matter and the registration form, **Instructor**, Charles Nagamine: telephone (808) 956-6007 (Honolulu), fax (808) 956-9675, email charlie@hpirs.stjohn.hawaii.edu.

Leaflet available before short course begins

For a free copy of the leaflet, *Test Your Math Skills*, contact the instructor or download it from the Internet at http://pestworld.stjohn.hawaii.edu/pat/schedule.html#Test_Your_Math_Skills_available. The leaflet presents exercises and answers that will help **trainees** refresh basic math skills needed to understand the instructor's calculation examples. The exercises review (1) common fractions and their decimal number equivalents, (2) rounding off, (3) conversions between • seconds and minutes • ounces and pounds • fluid ounces, pints, and gallons • square feet and acres, and (4) calculating square feet of rectangular areas. These basic math skills (and more) will help test-takers answer some of the certification exam questions.

Trainees who find the exercises difficult will get more benefit from the short course if they seek tutoring before the course begins.

* * *

Weed Management Slide Shows On-line

On the Internet at the Weed Science Society of America's web site, www.wssa.net/, there are links to two slide shows, "Non-Chemical Lawn and garden weed control" and "Lawn weed control using herbicides."

These slide shows present basic weed management options and safety practices for people who may use herbicides. If you educate employees or gardeners who must manage weeds in gardens and lawns, you could use these well-organized slide shows to present and discuss these options and practices. There is no spoken narration. A reasonable number of good photos and drawings appear in appropriate places. If used for a Hawaii audience, preview the shows so you will be ready for references to cold weather, pine needle mulch (probably not available in Hawaii), weeds not present in Hawaii, and "scientific" graphs and charts, which you could easily by-pass if your audience is not interested in research

continued on page 20

This newsletter is published by the Extension Pesticide Programs. For information on pesticide programs, please contact:

Dr. Barry Brennan or

Charles Nagamine

Department of Plant and Environmental

Protection Sciences

3050 Maile Way, Gilmore 310

University of Hawaii at Manoa

Honolulu, HI 96822

Telephone: 808-956-9208 (Brennan)

808-956-6007 (Nagamine)

Fax: 808-956-9675

Email: barryb@hawaii.edu

charlie@hpirs.stjohn.hawaii.edu

Editors: Dr. Barry Brennan and

Charles Nagamine

Mention of a trademark, company, or proprietary name in this newsletter does not constitute an endorsement, guarantee, or warranty by the University of Hawaii Cooperative Extension Service or its employees and does not imply recommendation to the exclusion of other suitable products or companies.

Caution: Pesticide use is governed by state and federal regulations. Pesticides and pesticides uses mentioned in this newsletter may not be approved for Hawaii, and their mention is for information purposes only, and should not be considered a recommendation. Read the pesticide's labeling to ensure that the intended use is included on it, and follow all labeling directions.

Weed Management Slide Shows On-line, continued from page 19

results. Overall the slide shows' authors do a very good job of presenting important points to discuss in a weed management lecture.

How to View the Slide Shows On-line

Use a computer that can download and run the free Macromedia Flash Player program.

- View the home page on the Internet at www.wssa.net/.
- Click on either title in the colored box at the top of the home page. The titles are "Non-Chemical Lawn and garden weed control" and "Lawn weed control using herbicides." Watch for the next web page.
- When the next web page appears, click on the phrase Start Here just under the big title at the top of the page.
- Read the words on a slide. To advance, click anywhere on the colored slide show screen. To cycle back to the first slide, continue clicking on the last slide.

* * *

Hawaiian Place Names

Ko'olau. Windward districts, Kauai, East Maui, and Molokai. Ditch and forest reserve, Nahiku qd.; gap, Kilohana qd., Maui. Windward mountain range, Oahu. Lit., windward.

From Place Names of Hawaii, a book by Mary Kawena Pukui, Samuel H. Elbert, and Ester T. Mookini. 1974. The University of Hawaii Press.

* * *