Information for pest management professionals and pesticide applicators

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Neonicotinoid Insecticide Use Under Increasing Scrutiny

Tight new regulations being imposed by European Union authorities and a widely publicized mass die-off of native pollinators in Oregon (see page 3) have recently brought neonicotinoids to the public's attention. Neonicotinoid insecticides are increasingly being scrutinized by regulators and the public alike throughout the world.

First developed in the late 1980s, neonicotinoids represented the first new class of insecticides in over 50 years. They are nervous-system toxins widely used in agricultural, horticultural, veterinary, and structural settings for broad-spectrum management of pest insects. Desirable qualities such as reduced toxicity to humans and pets (as compared to some organophosphates and carbamates) and systemic activity in plants led to rapid and widespread use. Imidacloprid, the first neonicotinoid developed, is now the most widely-used insecticide in the world. (See Table 1 for other active ingredients and common product names.)

From the beginning, it was recognized that foliar applications of neonicotinoids were quite broad in activity and would have negative impacts on beneficial insects. However, the high water-solubility and environmental persistence of neonicotinoids meant that applications could be made to landscape trees and shrubs using soil drenches or injections, trunk injections, and basal trunk sprays. The active ingredients would then be translocated into leaves and stems where pest insects feed.

…continued on page 2

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Neonicotinoid insecticides can be applied as soil injections. These materials are highly water soluble and very persistent in the environment. The chemical can be taken up by roots and translocated to all aboveground parts of a plant.

Table 1. Neonicotinoid active ingredients and common products used in California's urban landscapes.

Active ingredient (common name)	Representative products registered for use in urban landscape settings
acetamiprid	Tristar, many Ortho home-use products
clothianidin	Aloft, Arena, some Bayer Advanced products
dinotefuran	Safari, Zylam, some Ortho home-use products
imidacloprid	Marathon, Merit, Premise, many Bayer Advanced products
thiacloprid	Calypso
thiamethoxam	Amdro, Caravan, Flagship, Maxide, Meridian

WHAT'S INSIDE...

Neonicotinoid Insecticide Use Under Increasing Scrutiny

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In a recent study from DPR, imidacloprid was found in about half of the urban creeks sampled.

…continued from page 1

When considering large trees or shrubs in an urban environment, this approach is clearly the most efficient and least visible method of insecticide delivery. Additionally, such applications were expected to reduce the risk to nontarget organisms, since pesticide drift associated with foliar applications was minimized.

Now, after 20 years of use, neonicotinoids have become associated with serious nontarget effects and environmental contamination, regardless of the application method used.

The systemic action of neonicotinoids means it is possible that the active ingredients will be present in a treated plant's pollen and nectar, potentially impacting pollinators and other beneficial insects. This occurs even when application is via seed treatment. As a result, in April 2013, 15 of the 27 European Union (EU) member states voted to forbid the application of three neonicotinoids; imidacloprid, clothianidin, and thiamethoxam, to blooming plants. The EU further charges scientists and manufacturers to provide compelling evidence in support of the safety of the materials before restrictions will be lifted.

The recent mass die-off of native pollinators was attributed to an application of the neonicotinoid insecticide dinotefuran (see page 3). Negative impacts due to neonicotinoids have also been documented for earthworms, soil microorganisms, predatory beetles, and parasitoid wasps. Unexplained increases in spider mite reproductive rates in response to imidacloprid have been described. Finally, the widespread use of neonicotinoid insecticides in both urban and agricultural settings has been cited as a possible contribution to the global honeybee decline phenomenon known as Colony Collapse Disorder.

The water-solubility of neonicotinoids creates another problem in urban settings. Runoff from impervious surfaces during irrigation or rainfall can wash deposits of the long-lived materials into urban creeks and stormwater systems, potentially impacting invertebrates, which make up the base of the food chain in aquatic ecosystems.

Neonicotinoids have not often been recovered, or even targeted, in surface-water studies, since they are applied at very low concentrations and are often difficult to detect. With improved techniques and increased efforts to recover contaminants in water, however, regulators have begun to focus on this class of insecticides. For instance, a study published in 2012 by researchers with the California Department of Pesticide Regulation (Ensminger et al, 2012: http://www.ncbi.nlm.nih.gov/pubmed/22899460) revealed that imidacloprid was found in about half of the urban creeks sampled, making it the second most commonly recovered insecticide in the study.

These data may be a testament to the popularity of products containing imidacloprid with the general public. Many are combination products that deliver a fertilizer, herbicide or fungicide in addition to the insecticide. Improper application and improper disposal of such products may be contributing to the prevalence of the material highlighted in the article.

As regulatory scrutiny of neonicotinoids continues to increase, it is possible that applications of some active ingredients may be regulated or restricted. Pest management professionals have the ability and the opportunity to act as both environmental stewards, minimizing negative impacts to nontarget organisms, and product stewards, ensuring neonicotinoids remain available as tools within the pest management toolbox. This means strictly following pesticide label guidelines, limiting uses of neonicotinoids to those situations where they are required, delaying applications of systemic insecticides until after plants have flowered, and taking precautions to avoid depositing insecticides on surfaces, or in areas conducive to runoff into aquatic ecosystems.

Reference: Ensminger, M.P., Budd, R., Kelley, K.C., and K.S. Goh. 2013. Pesticide occurrence and aquatic benchmark exceedances in urban surface waters and sediments in three urban areas of California, USA, 2008 – 2011. *Environ Monit Assess* 185(5):3697-710.

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Oregon restricts use of landscape insecticide

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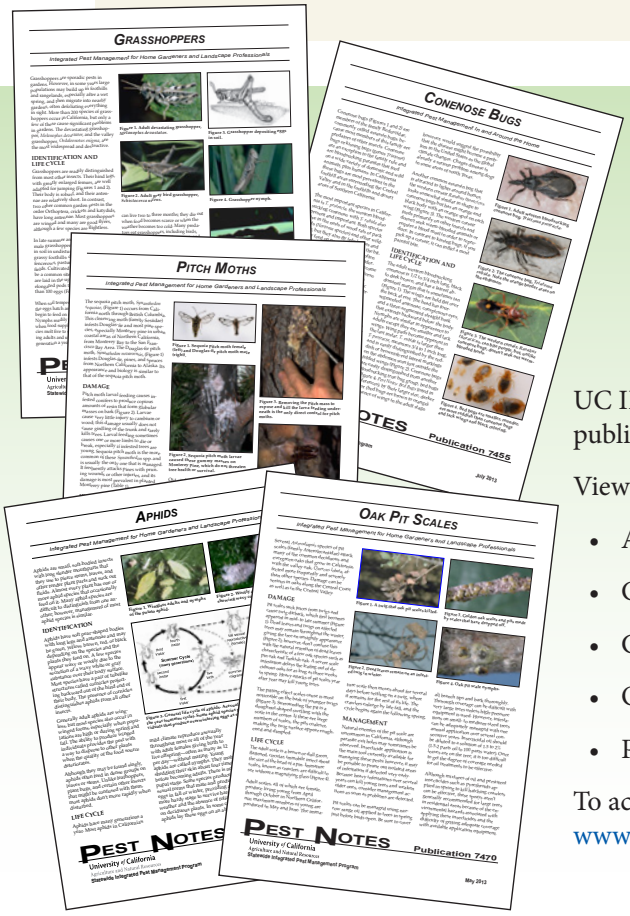
The yellow-faced bumblebee was one of the species affected in the Oregon bee kills.

On June 27, 2013, the Oregon Department of Agriculture placed a 180-day statewide moratorium on the application of all dinotefuran products (including the common landscape products under the Safari brand) on plants in landscapes, agriculture and gardens.

This action was taken after two massive bumblebee kills occurred after Safari was applied to linden trees in Wilsonville and Hillsboro, Oregon. Trees were in bloom and up to 50,000 bumblebees were reported killed. Multiple application methods were involved with a combination soil drench and foliar spray at one site and a basal bark treatment at the other. The Oregon Department of Agriculture has confirmed that the kills were directly related to the insecticide application and expects to release a full report on the incident sometime this fall.

While all the details of this bee kill are not yet known, it provides a good illustration of the importance of following the label, considering impacts on pollinators when choosing pesticides, and avoiding the application of insecticides to blooming plants.

—Mary Louise Flint, UC Statewide IPM Program and Entomology, UC Davis, mlflint@ucdavis.edu



Revised Pest Notes Now Online

UC IPM recently released five revised titles in its Pest Notes series of publications covering home, garden, landscape and wildlife pests.

View them on our web site:

- Aphids www.ipm.ucdavis.edu/PMG/PESTNOTES/pn7404.html
- Conenose Bugs www.ipm.ucdavis.edu/PMG/PESTNOTES/pn7455.html
- Grasshoppers www.ipm.ucdavis.edu/PMG/PESTNOTES/pn74103.html
- Oak Pit Scale www.ipm.ucdavis.edu/PMG/PESTNOTES/pn7470.html
- Pitch Moths www.ipm.ucdavis.edu/PMG/PESTNOTES/pn7479.html

To access almost 160 other titles, visit UC IPM's Pest Notes Web page www.ipm.ucdavis.edu/PDF/PESTNOTES/index.html

Compost Tea

The fundamentals of compost tea are very simple: it's merely compost suspended in a porous bag (like cheesecloth) and soaked in water. If the compost was of good quality, then the water typically takes on a dark, blackish color (appearing a lot like a strong black tea). However, compost tea quality depends on the quality of the parent compost, and compost can vary quite a bit in its makeup, depending upon what went into it and how it was processed.

Many claims are made for compost tea, including uses as a fertilizer and as a disease suppressant. Some of these claims are realistic, others rather fanciful. Since compost tea is basically a leached solution of compost, it often has many of the beneficial characteristics of that compost, but not always.

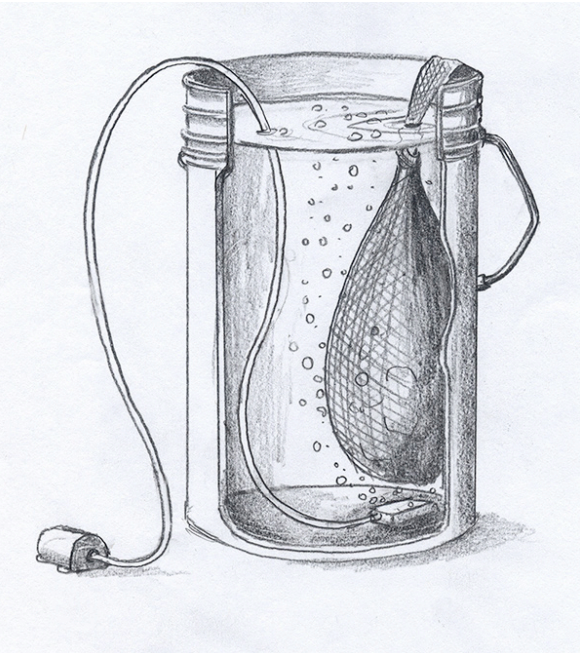
One of the benefits that compost tea imparts to the water is its nutrient content. Compost tea can work well as a liquid fertilizer, and in many instances some of the nutrients it contains can be taken up directly by the leaves of the plant, before the tea even reaches the ground. However, concerns about other liquid fertilizers apply to compost tea as well. Only as much compost tea should be applied as plants can absorb. Any more than this is likely to result in those same nutrients leaching into ground or surface waters. Any over-application of nutrients constitutes environmental pollution, regardless of whether it was from a natural or a synthetic source.

A simple search on the internet will unveil other claims for compost tea, including its purported ability to cure diseases. In order to address this claim, we must differentiate between two compost tea types: Aerated Compost Tea (ACT) and Non-aerated Compost Tea (NCT). Non-aerated tea can simply be made in a bag, as described above. Aerated compost tea is typically made in a vat with an agitator to insure an even oxygen distribution as it's made. To date, there are no peer-reviewed scientific studies that show that ACT reliably cures any disease, despite dozens of research projects aimed at investigating this over the past few decades.

Most of these studies were never published, presumably because they were viewed as failures by the investigators when ACT performed the same as water. In some instances, ACTs have actually been shown to increase disease severity on the plants they were applied to. There are also many studies that appear to show compost tea as effective, but most have serious flaws in experimental design. These are typically published in non-peer-reviewed journals where there is less scrutiny of experimental procedures. Non-aerated compost teas have a research record that is only slightly better, resulting in mild but consistently measurable suppressant effects on a few foliar plant diseases.

Regardless of these claims, compost teas are not registered as pesticides, so they cannot legally be applied to control insects or biotic diseases in a landscape setting. This is because in order to obtain registration in California, the product has to be shown to be consistently effective. Consistency can be hard to demonstrate for a biological product that may contain many different strains of fungi and bacteria, even if the parent material is relatively consistent, since weather plays a role in how compost develops.

This is not to say that compost teas don't have a place in the landscaper's toolbox; all current research to date shows compost tea to be a good natural delivery tool for a quick boost of nutrients. As such, applicators should take care to use compost teas in a judicious manner. Plain old compost, not the tea, typically acts to release those same nutrients in a slower manner, plus it has the added benefits of cooling and cushioning the soil. So to really get the most out of your compost, perhaps it's best to apply it to the landscape, and let nature make the tea with rain or irrigation water, unless you have a specific need for a quick boost, and are sure you know how much to use.



Typical aerated compost tea set up. Compost is placed in cheesecloth or burlap bag and immersed in a container of water until the water becomes dark. Water may be aerated with an aquarium pump as shown here or produced without aeration. (Drawing by David Nessl, UCIPM)

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Removing Poison-Oak from Landscapes and Recreation Areas

Removal of poison-oak requires special care. Most people are allergic to it, exhibiting skin rashes when they come in contact with it. Good control may require a combination of techniques and repeat herbicide applications in subsequent years.

Poison-oak can be removed through mechanical methods, but most managers combine mechanical and chemical control. Grazing by sheep and goats can be effective in small areas. Don't burn poison-oak, since it creates a serious health hazard and doesn't effectively reduce infestations.

Mechanical control

You can physically remove plants located in a yard or near houses through hand pulling or mechanical grubbing using a shovel or pick. It is essential to remove the entire plant including its roots. Remove plants in early spring or late fall when the soil is moist and it is easier to dislodge rootstocks. Grubbing when the soil is dry and hard usually will break off the stems, leaving the rootstocks to vigorously resprout. Detached and dried brush still can cause dermatitis, so bury or stack the plant material at an out-of-the-way location, or take it to a disposal site. Again, never burn poison-oak.

Ideally, anyone engaged in hand pulling poison-oak should have a high degree of tolerance to the allergen. Whether you are sensitive or believe you are immune, wear appropriate protective clothing, including washable cotton gloves over plastic gloves. Wash all clothing thoroughly, including shoes, after exposure. In case of contact with poison-oak, shower immediately after handling plants to reduce risk of absorption of plant oils into skin.

Other forms of mechanical control have not proven to be successful. Brushrakes and bulldozers often leave pieces of rootstocks that can readily resprout. In some cases, brush removal late in summer, when plants are experiencing moisture stress, can slow their ability to recover. Mowing has little effect in poison-oak control, unless you perform it at least four times during the growing season. Within 2 months of germination, young plants usually have produced underground rootstocks large enough to recover from mowing damage. A single plowing is of no value and often serves to propagate and spread the shrub. However, good seedbed preparation and planting cultivated crops for a year or more will help control poison-oak infestations.

Herbicides

A variety of herbicides are available for poison-oak control. Effectiveness depends on timing of application. Always follow label instructions when applying herbicides.

Stump Application. Stump treatments are most effective during periods of active growth. Cut poison-oak stems 1 to 2 inches above the soil surface, and apply the herbicide immediately to the stump surface. A delay in treatment will result in poor control. Apply an herbicide such as glyphosate or triclopyr with a paint brush that is 1 to 2 inches wide or with a plastic squeeze bottle that has a spout cap. Treatment solutions should contain either undiluted glyphosate (use a product that contains at least 20% glyphosate), triclopyr amine, or a 20 to 30% triclopyr ester solution mixed with 70 to 80% methylated or ethylated seed oil.

Be sure to completely cover all surfaces of the stumps with the herbicide until it runs down the base of the stubs. Spray any regrowth from cut stumps with a foliar spray when the leaves fully expand. Always wear gloves and avoid direct contact with plant to avoid risk of dermatitis.

…continued on page 6

J.K. CLARK UC

Poison-oak foliage and flowers

J.K. CLARK UC

Poison-oak foliage turns red in fall before dropping.

Removing Poison-Oak from Landscapes and Recreation Areas

…continued from page 5

Basal Application. Basal bark applications can be made almost any time of the year, even after leaves have discolored or dropped. Apply 20% the ester form of triclopyr to basal regions of poison-oak using a backpack sprayer with a solid cone, flat fan, or a straight-stream spray nozzle. Mix with 80% oil carrier (such as seed oil) to enhance herbicide uptake across the bark. Thoroughly cover a 6- to 12-inch basal section of the stem, but not to the point of runoff. Water soluble herbicides, such as the amine form of triclopyr and glyphosate, will not be able to penetrate into the bark and, thus, give no control.

Foliar Sprays. The effectiveness of herbicides applied to poison-oak foliage depends upon the plant's growth stage, good spray-to-wet coverage, and proper concentration of the herbicide. Foliar application is most effective after leaves are fully developed and when the plant is actively growing. This period is normally from after the bloom stage up to the time when the fruit are fully developed. This corresponds with early summer to early fall, depending on the location. Do not apply herbicides before plants begin their spring growth or after the leaves have begun to turn yellow or red in late summer or fall, as these timings will not result in adequate herbicide movement to the roots.

To achieve spray-to-wet coverage, all leaves and stems should be glistening following herbicide application. However, coverage should not be to the point of runoff. One application of an herbicide does not usually control poison-oak completely. Treat again when new, sprouting leaves are fully expanded, generally when the plants are about 2 feet tall. Watch treated areas closely for at least a year, and retreat as necessary. Herbicides used for foliar treatment of poison-oak include imazapyr, glyphosate (must be at least 2%), triclopyr amine or triclopyr ester plus 2,4-D ester, and dicamba.

Adapted from J. M. DiTomaso and W.T. Lanini. Pest Notes: Poison Oak. UCANR Publication 7431. For more information, view this publication online at http://www.ipm.ucdavis.edu/PMG/PESTNOTES/pn7431.html

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Ask the Expert!

Q **If I've touched a poison-oak plant, what is the best way to prevent an allergic reaction?**

A The best way to prevent skin irritation is to pour a mild solvent such as isopropyl (rubbing) alcohol on the exposed skin and then wash with plenty of cold (not warm) water. This works best if applied within five minutes of exposure. Detergent soap with plenty of cold water can also remove the oil that causes skin rashes. Don't use hand wipes or small amounts of water. These are more likely to spread the poison-oak oil around than remove it. There are also commercial skin cleaners (such as Tecnu) that are very effective—workers who have frequent exposure to poison-oak would be wise to keep such products on hand. Applied with water, some products can prevent rash several hours after exposure.

Q **Where can I find more information about managing weeds in natural areas?**

A The California Invasive Pest Council (Cal-IPC) has several practical books available for land managers trying to control invasive toxic plants in recreation and wildland areas. Find them at http://www.cal-ipc.org/shop/index.php.

WHAT IS IPM? Integrated Pest Management (IPM) programs focus on long-term prevention of pests or their damage through a combination of techniques including resistant plant varieties, biological control, physical or mechanical control, and modification of gardening and home maintenance practices to reduce conditions favorable for pests. Pesticides are part of IPM programs but are used only when needed. Products are selected and applied in a manner that minimizes risks to human health, beneficial and nontarget organisms, and the environment.