



Editor's note

A feature article in this issue describes recent actions of the Central Coast Regional Water Quality Control Board, and with those actions in mind, we also include feature articles on crop fertilization and fertilizers. We hope that they can help you evaluate and improve your fertilization program.

Related to this is the Ventura and Santa Barbara Regional Report from Julie Newman on how the Australian horticulture industry is addressing their water issues. Julie has another article discussing the Australian nursery industry.

Regional Reports from Santa Cruz and Monterey (Tjosvold) and San Diego (Jim Bethke) include information about new invasive pests. A Santa Clara County regional report from Maria de la Fuente describes her observations at the California Pack Trials last spring.

Finally, we include the New Publications section with recent publications from UC Agriculture and Natural Resources, and Campus News that describes activities by researchers on the Davis and Riverside campuses.

Steve Tjosvold
Managing Editor

"New" ag waivers from two regional water quality control boards

by Julie Newman

There are nine regional water quality control boards (regional water boards) that administer federal and state water quality regulations in California (fig. 1) and each has taken a different approach to controlling runoff from agricultural lands. Currently, four regional water boards (3, 4, 5 and 9) have adopted a "conditional waiver" or "conditional ag waiver" for irrigation runoff. Ag waiver programs are state programs that require the owners of irrigated farmland to control discharges (irrigation and stormwater runoff) from their property to protect surface and groundwater. A waiver is good for five years and is "conditional," meaning that it can be revoked at any time. Growers are required to adopt Best Management Practices (BMPs) to prevent pollutants from entering water bodies, and check lists of BMPs are required in Region 3 and Region 4. Groups, watersheds or individuals must monitor water where agricultural lands drain to assess the impacts of discharges from irrigated lands. Property owners, employees or other farm representatives are required to complete farm water quality education. In Region 3, growers are also required to develop a farm water quality plan. Recently, a significantly stricter ag waiver program has been proposed for growers in Region 3, while the bar is being raised in Region 4 with the adoption of a new waiver last October.



Fig. 1. The Porter–Cologne Act established the State Water Resources Control Board as the statewide water quality planning agency and gave authority to nine Regional Water Quality Control Boards.

Central Coast Region (Region 3)

The Central Coast Region extends from Santa Clara County south to northern Ventura County, including 378 miles of coastline (fig. 2). The Central Coast Region includes all of Santa Cruz, San Benito, Monterey, San Luis Obispo and Santa Barbara counties; it also includes the southern part of Santa Clara County and

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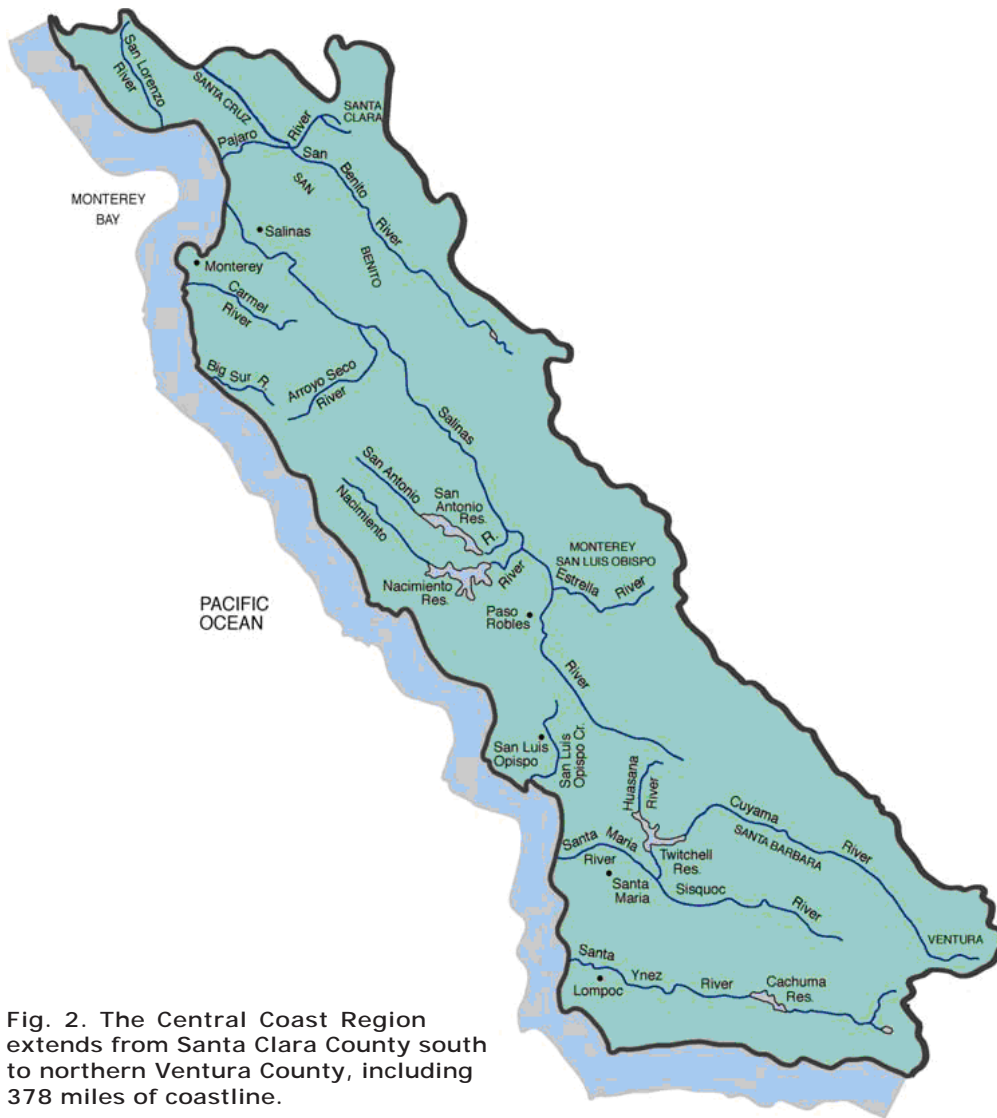


Fig. 2. The Central Coast Region extends from Santa Clara County south to northern Ventura County, including 378 miles of coastline.

small portions of San Mateo, Kern and Ventura counties. The Central Coast of California is one of the most productive and profitable agricultural regions in the nation, reflecting a gross production value of more than six billion dollars in 2008.

More than 1,800 growers and farming companies participate in the current waiver program, representing 390,000 acres or 95 percent of the commercially farmed land in the region. Monitoring has been conducted individually or through participation in the Cooperative Monitoring Program (CMP). The CMP has been managed by the [Central Coast Water Quality Preservation, Inc.](#), a non-profit corporation founded by farmers to operate the CMP on behalf of irrigated agriculture on the Central Coast. Monitoring sites have been in receiving waters, primarily with agricultural drainage.

The conditional waiver was first established

in July 2004 and expired in July 2009. A one-year extension of the waiver was approved. Because ag waiver monitoring data continued to exceed water quality objectives with impairment of surface and groundwater (including drinking water contaminated by nitrates from fertilizers), the Central Coast regional water board developed a new draft waiver last February which required on-farm monitoring to ensure compliance and identify farm operations that are pollution sources. Growers were concerned about the amount of recordkeeping that was proposed, requiring individual on-farm monitoring that was subject to public scrutiny. Growers were also concerned that the plan did not consider the different types of agriculture, irrigation methods, topography and geography in the region. Furthermore, the draft proposal posed special challenges for nursery growers. For example, the original proposal would have required separation of rainwater from container plants, which meant

that some outdoor nursery growers would have had to construct greenhouses in areas where greenhouse permits are impossible or difficult to obtain.

In July 2010, the Central Coast water board extended the ag waiver another year so that alternative plans for a new waiver could be examined. A coalition of more than 50 farm groups and individual growers presented alternative plans that the board considered along with alternative plans proposed by other groups.

On November 19, the Central Coast water board released recommendations for a new waiver based on tiers: farm operations (dischargers) must meet conditions for the appropriate tier that applies to their land and/or their operations. Tier levels are assigned based on the following criteria: (1) proximity of the farm operation to impaired water bodies listed on the Clean Water Act section 303(d) list for agricultural pollutants (i.e., toxicity, pesticides, nutrients or sediment); (2) discharger use of chlorpyrifos or diazinon; (3) whether the farm operation grows certain row crops which the board deems as having a high potential to discharge nitrogen to groundwater (e.g., beet, broccoli, cabbage, cauliflower, celery, Chinese cabbage, collard, endive, kale, leek, lettuce, mustard, onion, parsley, pepper, spinach and strawberry); and the size of the operation. A summary of the draft order is presented here, but it does not include all requirements and specifications. It is recommended that growers refer to the entire document, which can be found on the Central Coast water board website at <http://www.swrcb.ca.gov/centralcoast/> under "Ag Order Updates and Comments."

Tier assignment. *Tier 1* is the lowest risk group and applies to farm operations that do not use chlorpyrifos or diazinon and are not located within 1,000 feet of an impaired surface waterbody listed for agricultural pollutants. In addition, if the farm produces the row crops that the Central Coast water board deems as high risk, the total irrigated acreage must be less than 1,000 acres.

Tier 2 applies to all farm operations that discharge a moderate level of waste or that the board deems as posing a moderate threat to water quality, do not meet the Tier 1 or Tier 3 criteria, and meet one of the following sets of criteria: (1) The farm operation is located within 1,000 feet of an impaired

surface waterbody listed for agricultural pollutants, but total irrigated acreage is less than 1,000 acres and the discharger does not use chlorpyrifos or diazinon; (2) The discharger does use chlorpyrifos or diazinon, but the farm operation is not located within 1,000 feet of an impaired surface waterbody listed for agricultural pollutants and the total irrigated acreage is less than 1,000 acres; or (3) The operation total irrigated acreage is $\geq 1,000$ acres, but is not located within 1,000 feet of a surface waterbody listed for agricultural pollutants, does not include any of the row crops that the board deems as having a high potential to discharge nitrogen to groundwater, and the discharger does not use chlorpyrifos or diazinon.

Tier 3 applies to all farm operations that discharge a high level of waste or that the board deems as posing the highest threat to water quality, and meet one the following sets of criteria: (1) The total irrigated acreage is $\geq 1,000$ acres and includes crops deemed as having a high potential to discharge nitrogen to groundwater or the discharger

applies chlorpyrifos or diazinon; or (2) The farm operation is adjacent to or contains a waterbody listed for agricultural pollutants and the discharger applies chlorpyrifos or diazinon.

Requirements for all tiers. All farm operations must sample private domestic and agricultural supply groundwater wells on their operations and conduct receiving water quality monitoring (i.e. sites where agricultural lands drain). Receiving water quality monitoring can be conducted by participating in a cooperative monitoring program (e.g., the Cooperative Monitoring Program developed for the 2004 Agricultural Order). As in the previous waiver, all dischargers must have a farm water quality management plan which must be updated at least annually and complete water quality education requirements (15 hours within 18 months of the adoption of the order or enrollment).

Additional requirements for Tier 2 and Tier 3. There are photo documentation requirements for dischargers with operations

adjacent to or containing an impaired waterbody identified for temperature, turbidity or sediment. Photo monitoring must document the condition of streams and riparian and wetland area habitat, the presence of bare soil vulnerable to erosion, and relevant mitigation measures. Tier 2 and 3 dischargers must also prepare an additional report, the Annual Compliance Document, to provide up-to-date information to assist the board in the evaluation of threat or impact to water quality from agricultural discharges and evaluate progress towards compliance. Included in the requirements for the Annual Compliance Document, Tier 2 and Tier 3 dischargers must report nitrate loading risk factors and overall nitrate loading risk calculated for each ranch/farm or nitrate loading risk unit. The nitrate loading risk factor is a measure of the relative risk of loading nitrate to groundwater. The nitrate loading risk unit may be the total ranch, a number of blocks or an individual block. Within two years from adoption of the order or enrollment, Tier 2 and Tier 3 dischargers with high nitrate loading risk must record total nitrogen applied per crop, per acre to each farm/ranch or nitrate loading risk unit; by October 1, 2014 this must be reported in the Annual Compliance Document.

Additional requirements for Tier 3. Within one year from adoption of the order or enrollment, Tier 3 dischargers with a high nitrate loading risk must determine the typical crop nitrogen uptake for each crop type produced and report the basis for the determination; within two years, these dischargers must (1) develop and initiate implementation of an Irrigation and Nutrient Management Plan (INMP) certified by a Professional Soil Scientist, Professional Agronomist or Crop Advisor, or (2) propose a discharge groundwater monitoring and reporting program (GMRP) plan to evaluate waste discharge to groundwater from each ranch/farm or nitrate loading risk unit and assess if the waste discharge is of sufficient quality that it will not cause or contribute to exceedances of any nitrate water quality standards in groundwater. There are detailed requirements for the INMP and information to be included in the Annual Compliance Document. There are also specific documentation requirements within three years of the adoption or enrollment of the order to demonstrate improved irrigation and nutrient management efficiency, improved nitrogen balance ratios, and reduced nitrate loading to groundwater; within five years,



Fig. 3. Region 4 boundary (delineated in green) includes all the coastal watersheds of Los Angeles and Ventura Counties, as well as portions of Santa Barbara and Kern County.

there are specifications to demonstrate overall effectiveness. Furthermore, Tier 3 dischargers with operations adjacent to or containing a waterbody identified on the 2010 List of Impaired Waterbodies for temperature, turbidity or sediment must submit a Water Quality Buffer Plan that protects the listed waterbody and its associated tributaries; all Tier 3 dischargers must conduct individual discharge monitoring and submit individual discharge monitoring reports.

The ag waiver order becomes effective on March 17, 2011 and the deadline for comments was January 3, 2011. The board received a draft alternative proposal on behalf of seven county farm bureaus and various other groups, including the California Cut Flower Commission (CCFC) and the California Association of Nurseries and Garden Centers (CANGC) on December 3, 2010. Flower and nursery growers representing CANGC and the CCFC also prepared and submitted an additional comment letter to the board. They hope to work with the board to come up with a mutual resolution of the water quality issues within the Central Coast regional watershed.

Los Angeles Region (Region 4)

The Los Angeles Region is the most densely populated water quality region in the state. It includes all the coastal watersheds of Los

Angeles and Ventura Counties, and small portions of Kern and Santa Barbara Counties (fig. 3). There are two group waivers in this region: Nursery Growers Association-Los Angeles County Irrigated Lands Group (NGA-LACILG) and Ventura County Irrigated Lands Group (VCAILG). The largest program is VCAILG, which is coordinated by the Ventura County Farm Bureau. It includes about 1,486 of Ventura County's 1,646 agricultural landowners and represents about 92% of the irrigated agricultural acreage (approximately 125,000 acres total). The monitoring program is conducted in receiving waters and most monitoring sites capture runoff from only irrigated agricultural land. The cost of the program is divided among growers and is based on acreage. Since 2006, VCAILG spent \$1.3 million—an average of \$15 per acre for members.

The Nursery Growers Association developed the NGA-LACILG waiver program. As of July 2009, there were 237 enrolled sites comprising about 2,232 acres. Monitoring is conducted on nursery sites. Current waiver fees are \$950 for nurseries under five acres and \$1,450 for parcels over five acres. Late fees apply.

The Los Angeles regional water board first adopted their conditional waiver on November 3, 2005; on October 7, 2010 this waiver was renewed for another five years.

Although there are no major changes in the renewed waiver, because monitoring data has exceeded water quality benchmarks, it is imperative that all growers implement effective BMPs during this waiver period and that measurable progress towards water quality objectives is demonstrated. Complete details regarding the renewed waiver can be found at the Los Angeles regional water board website at <http://www.waterboards.ca.gov/losangeles/> under "Agricultural Waiver."

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Visit the UCNFA News website at <http://ucanr.org/sites/UCNFAnews/> to view individual stories in an online format.

Visit the main UCNFA website at <http://ucanr.org/sites/UCNFA/news/> to access the archive of *Corf News*, our former publication from 1999 - 2009.

New Publications from Agriculture and Natural Resources (ANR)

compiled by Steve Tjosvold

Protecting Surface Water from Sediment-Associated Pesticides in Furrow-Irrigated Crops

Description: When pesticide residues get into stream water and in-stream sediments, they can last for anywhere from a few days to decades or more. Learn how to keep these chemicals out of surface water runoff, and out of our state's waterways.

Publication Number: 8403

Author: R. LONG, A. FULTON, B. HANSON

Inventory Type: PDF File

Language: English

ISBN-13: 978-1-60107-682-3

Copyright Date: 2010

Length: 16 pp.

Link: <http://anrcatalog.ucdavis.edu/pdf/8403.pdf>

Establishing Hedgerows on Farms in California

Description: A hedgerow is a border of trees, shrubs, perennial grasses, forbs, rushes, or sedges that surrounds a farm field and can reduce the effects of wind and water erosion, provide habitat for beneficial insects, and more. Find out if a hedgerow is right for your farm.

Publication Number: 8390

Author: R. LONG, J. ANDERSON

Inventory Type: PDF File

Language: English

ISBN-13: 978-1-60107-662-5

Copyright Date: 2010

Length: 7 pp.

Link: <http://anrcatalog.ucdavis.edu/pdf/8390.pdf>

Diagnosing Soil Physical Problems

Description: Plants may grow poorly for many reasons, and many of those may lie underground in the soil. Learn to identify a number of common soil problems so you can seek help to fix them.

Publication Number: 2664e

Author: WILLIAM E. WILDMAN

Inventory Type: PDF File

Language: English

Copyright Date: 1976

Length: 9 pp.

Link: <http://anrcatalog.ucdavis.edu/pdf/2664e.pdf> ◆

The use of controlled-release fertilizers (CRF) as part of a Best Management Program (BMP) to improve nutrient uptake efficiency and mitigate nutrient runoff

by Donald Merhaut

Solid fertilizers include granules, prills, crystals and powders. A prilled fertilizer is a type of granular fertilizer that is nearly spherical made by solidifying free-falling droplets in air or a fluid medium. Most controlled-release fertilizers (CRFs) used in commercial nurseries are prilled fertilizers that have been coated with sulfur or a polymer. These products have been developed to allow a slow release of nutrients into the root zone throughout crop development. In the following article we will describe several characteristics of CRFs that should be understood and various cultural practices that should be implemented to optimize nutrient use and minimize nutrient leaching when CRFs are part of a fertilization program.

How controlled-release fertilizers work

Nutrients are released out of coated fertilizer prills through osmosis at a rate that is positively correlated with increased temperature. The release rates are associated with the type and/or thickness of the coating on the fertilizer prill granule. Different manufacturers estimate the nutrient release rates of their products under different temperature regimes. For example, some manufacturers test release rates of their products at a constant temperature of 70°F, while other manufacturers test release rates at a constant temperature of 82°F. Most manufacturers test at a constant temperature between 70-82°F. If temperatures go above these thresholds, nutrient release rates are faster and product longevity (length of time some available fertilizer remains in the coated granule) decreases (fig. 1). Likewise, if temperatures are below these thresholds, the nutrient release rates slow down, but the longevity of the products is longer.

CRF products available - longevities

CRF fertilizers are available with different longevities. Most manufacturers have products with 3, 6, 9, or 12-month release periods. Products with different longevities are manufactured by blending fertilizer prills of different coating thicknesses: the thinner coated prills release nutrients first and then the thicker-coated prills release nutrients later. Short-term crops such as annuals would

probably require 3-month release products and longer-term crops such as woody perennials would require fertilizer products with a 12-month release period. Keep in mind that if the nursery production facility is near the cooler coast, fertilizer release rates will be slower and the CRF will last longer. Likewise, for hot inland climates, CRFs may release quickly and last for a shorter duration.

Cultural practices

Various cultural practices related to the use of fertilizers such as fertilizer application, irrigation, and fertilizer and soil/substrate storage are described below. It is important that certain Best Management Practices (BMPs) are implemented when using fertilizers to prevent off-site movement in runoff water or leaching into groundwater. BMPs associated with these cultural practices and the rationales for implementation are summarized in Table 1.

Application methods. The CRFs can be added to containers via four methods: (1) topical application, (2) blended into media, (3) dibble, and (4) layered. The primary focus of the application method should be to optimize fertilizer release from the prills in proximity to actively growing roots.

Topical applications (fig. 2) apply the CRFs to the surface of the containers either by hand or by a spreader. With this cultural practice, the fertilizer is released from the prills and the nutrients will move down into the root zone. Close-spacing of containers during topical application is important to prevent fertilizer spillage between containers.

Blending into media (fig. 3) can be done, especially if a medium is custom blended. In this process, the fertilizer prills are uniformly mixed into the media and fertilizer is released throughout the medium. It is important to minimize direct fertilizer contact with blades and mixers to prevent prill cracking which can lead to fertilizer leakage.

Dibble applications (fig. 4) are done by adding a premeasured amount of CRF into holes augured into containers during the canning process. The plant liner or plug is then placed into the hole. If automated, this process can save time, money and increase crop uniformity.

Layer applications (fig. 5) are done by adding media to a container part way, then spreading the CRF to the container, adding the plant plug or liner, and adding media to the rest of the container. The use of layer applications is a BMP used in humid climates to prevent nitrogen volatilization that can especially occur when CRFs are spread on the surface of containers.

Irrigation programs. Even though CRFs offer slow release of fertilizers and can mitigate nutrient runoff, improper irrigation practices can leach nutrients past the root zone, increasing the possibility of nutrient runoff. Therefore, the BMPs listed in table 1 should be practiced; otherwise, the benefits of using CRFs are lost. It is important that the growing medium is uniformly moistened without over-irrigation. In addition, the use of wetting agents is recommended for hydrophobic media such as peat. Another BMP that can promote uniform wetting of the media is the use of pulse irrigation. Pulse irrigation can apply the same total amount of water as conventional application but in multiple, smaller applications. The pulse irrigation first provides water that pre-moistens the medium. Subsequent irrigation cycles later provide easy, uniform absorption of water from the already pre-moistened substrate.

Fertilizer and soil/substrate storage. Even though the fertilizer in CRFs is coated in a polymer or sulfur coating, improper storage can still result in fertilizer loss. Fertilizers should be stored in a cool, dry location. Wet or humid environments will result in caking of granular fertilizers and volatilization of the fertilizer out of CRF prills (which can be determined if the prills are found to be hollow). Likewise, if CRFs are blended into the media, the product should be used immediately or the substrate should be stored in a cool location. Fertilizer storage structures should comply with local, state, and federal guidelines. They should include a concrete pad and curb to contain spills and leaks and be protected from rainfall and irrigation. They should be constructed as far away as possible from water conveyances.

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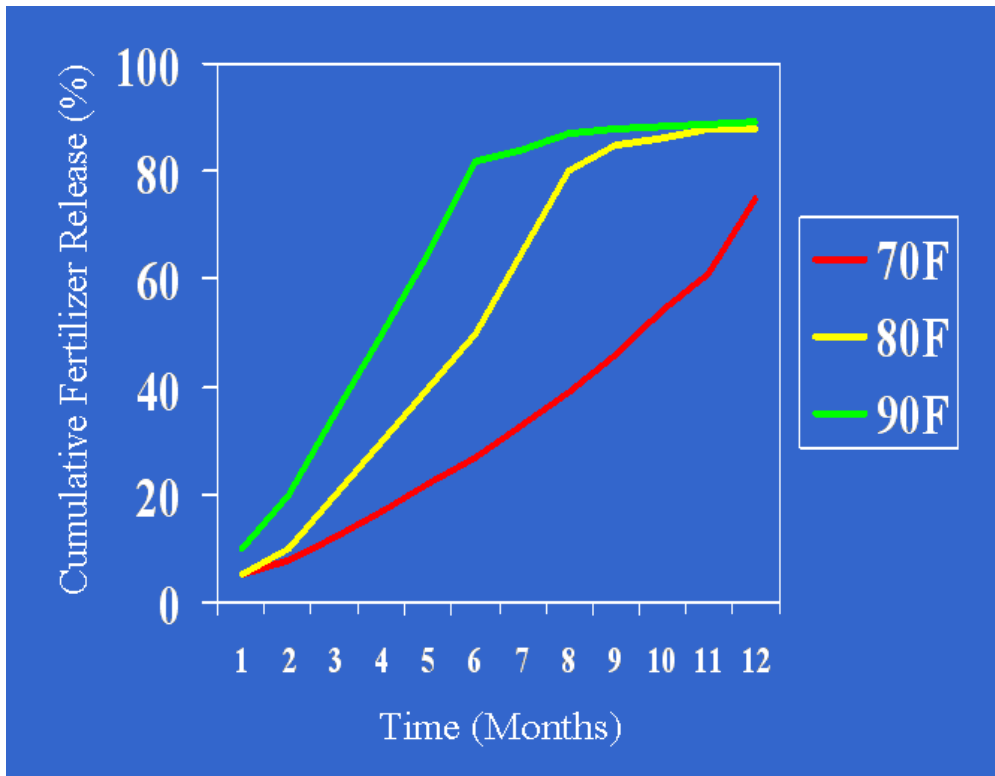


Fig. 1. Release rates from a polymer-coated fertilizer designed to release nutrients over a 12-month period at 70°F. At higher temperatures, the nutrient release rate increases and the longevity of the product decreases. At 80°F, the product releases all of the fertilizer out of the polymer over an 8-month period. At 90°F, the product releases all of the fertilizer out of the polymer within a 6-month period.

Table 1. BMPs associated with specific cultural practices and the rationales for BMP implementation.

Cultural practice	BMP	Rationale
Topical application of fertilizer	If a fertilizer spreader is used to broadcast the prills, space the containers can-tight and/or sweep up any prills that do not land in the containers.	If the containers aren't spaced closely during application, much of the fertilizer will land on the ground resulting in nutrient release into runoff water or leaching into groundwater.
Blending fertilizer into the medium	Minimize CRF prills' impact with mixers and blades.	Cracking of the coatings will result in a rapid release of fertilizer, which will shorten the longevity of the product and increase the likelihood of nutrient leaching, especially during the beginning of production cycle.
	Prepare only enough media that will be used immediately (see fertilizer storage).	Piles of media will heat quickly and result in an accelerated release of nutrients from the CRF prills. This may result in crop burn from excess fertilizer salts released into the media and nutrient leaching from the medium when irrigation begins.
Layer fertilizer application	Sandwich the fertilizer with media when planting.	This process is practiced in humid climates and is done to prevent nitrogen volatilization, which can especially occur when CRFs are spread on the surface of containers.
Irrigation management	Do not overirrigate.	Overirrigation causes excess leaching of nutrients out of the root zone as nutrients are released from the prills.
	Determine the size of the root systems in the containers.	Root volume is important because this dictates how much of the container volume is being utilized for nutrient uptake.
	Especially when using drip irrigation, be sure that the container medium is uniformly moistened.	This is important because otherwise only a portion of the container volume will be utilized for root growth and nutrient uptake.
	If the substrate being used has a tendency to become hydrophobic (repel water), be sure that the medium is never allowed to dry out.	Hydrophobic media such as peat are difficult, if not impossible to rewet.
	If the substrate is hydrophobic, consider another substrate or utilize a surfactant to increase wettability of the substrate.	Hydrophobic media are difficult to moisten and a uniformly moist media is necessary for fertilizer uptake.
	Consider pulse irrigation programs to improve uniform wetting of the media.	The growing medium has more time to absorb the water (thus reducing leaching) and the water is more uniformly distributed, which facilitates root uptake.
Fertilizer and substrate storage	Store all fertilizers in a cool dry location, protected from rainfall and irrigation.	Wet or humid environments will result in caking of granular fertilizers and volatilization of the fertilizer out of CRF prills. Rain or irrigation near fertilizer storage can result in runoff.
	If any type of fertilizer, granular or CRF, is blended into media, do not store the media.	Blended granular fertilizers that are stored will solubilize and CRFs will start releasing nutrients. These processes are accelerated as the temperature of the medium increases.
	Fertilizer storage structures should include a concrete pad and curb.	A concrete pad and curb will help to contain spills and leaks.
	Fertilizer storage should be constructed as far away as possible from water conveyances.	This practice will help to prevent contamination of waterbodies by fertilizer.

Topical Applications



Fig. 2. Topical application of fertilizer: Fertilizer is placed only on top of the containers. Fertilizer is released and percolates down through the entire container. Nitrogen loss through volatilization may also occur, especially in more humid environments.

Blended Applications

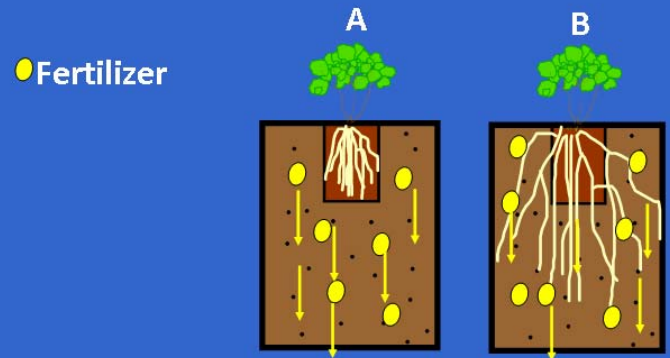


Fig. 3. Blended application of fertilizer: Fertilizer is blended throughout the medium. Fertilizer is released and percolates down through the container. Initially, any fertilizer released from the prills will likely leach from the container (A). As roots develop, the chances of fertilizer uptake increase (B). However, fertilizer granules near the bottom of the container have less chance of encountering a root. Therefore, fertilizer granules toward the bottom of the container have a greater likelihood of leaching out of the container.

Dibble Applications

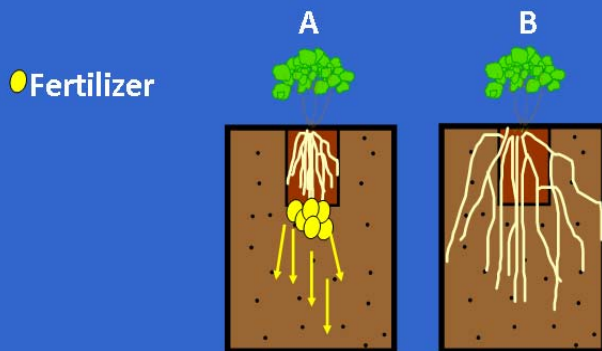


Fig. 4. Dibble application of fertilizer: Fertilizer is placed at the base of an augured hole, immediately below the planted liner or plant plug. Initially, any fertilizer dissolved and released from the granules or prills will leach out of the container (A), if not tied-up onto the media. Later, as root systems develop through and below the dibble of fertilizer, the likelihood of nutrient leaching will decline since more of the fertilizer will come in contact with the root system (B).

Layered Applications

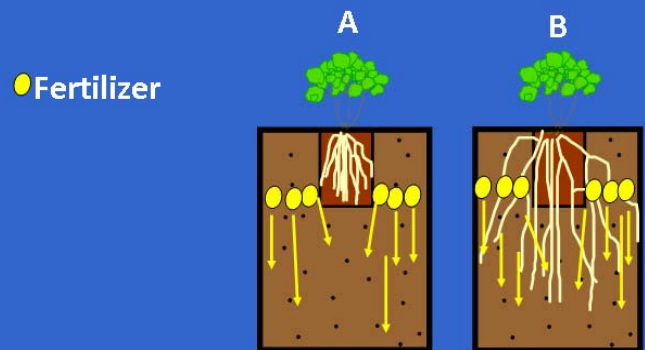


Fig. 5. Layered application of fertilizer: Fertilizer is placed in a layer, on top of a partially filled container. Additional media is placed on top of the fertilizer layer. This process is similar to topical applications, but reduces or eliminates nitrogen volatilization from the top. Initially, any fertilizer dissolved and released from the granules or prills will leach out of the container (A), if not tied-up onto the media. Later, as root systems develop, the likelihood of nutrient leaching will decline since more of the fertilizer will come in contact with the root system (B).

Tailoring fertilizer rates for diverse nursery crops

by Richard Evans and Linda Dodge

Current water quality standards in California necessitate much more careful fertilization practices by nursery growers. The fertilizer recommendations growers have relied on for decades must be reconsidered because they were established at a time of low fertilizer costs when agricultural water quality regulations were not as strictly enforced. Under those conditions, most guides recommended fertilizer applications well in excess of crop needs. Now, unless leaching and runoff water are captured on nursery property, growers need to tailor fertilizer application rates to meet crop needs with a high level of efficiency.

Factors like variable weather, changes in fertilizer release rate and lack of uniformity in irrigation systems can wreak havoc on the best fertilizer management practices. The biggest obstacle, however, is the variation in fertilizer requirements among the thousands of species and cultivars grown in our nurseries. Food and fiber crop producers have a limited number of varieties or cultivars to choose from, so researchers can easily develop specific fertilizer recommendations for those crops. Those specific recommendations don't exist for most nursery crops, and they never will. There are too many different crops and too few researchers to make that happen.

There are a couple of things nursery growers can do. First, make a rough estimate of how efficiently you are using fertilizers. Take a look at your records of fertilizer purchases and calculate how many pounds of nitrogen and phosphorus you put on your crops in a year. You'll need a calculator or spreadsheet to do it. Multiply the total weight of each type of fertilizer by the percentage nitrogen content. For example, calcium nitrate usually is 15.5% nitrogen, so 100 pounds of the fertilizer contains 15.5 pounds of nitrogen. Add together the weight of nitrogen from all of the nitrogen fertilizer sources to find out how much you apply. If it is more than 500 pounds per acre in a year for woody species, you're probably applying too much nitrogen. For herbaceous species, the upper limit is probably about 800 pounds per acre. Then do the same thing for phosphorus fertilizers. The maximum amount of phosphorus (as P_2O_5) per acre for woodies should be about 120 pounds annually. For herbaceous plants it shouldn't exceed 200

pounds per acre. These recommendations assume very high growth rates and crops covering about 70% of the ground surface.

If you have been applying fertilizer at rates higher than those maximum values stated above, you need to take measures to improve fertilizer use efficiency. If your application rates are below those stated above, please follow along – your application rates still might be too high, depending on how fast your crops grow and how much of the acreage is actually occupied by plants.

Growers can improve fertilizer use efficiency by matching application rates to crop demand. Since we lack information about the nutrient requirements for most crops, we have to make some generalizations. To get the information we need for these generalizations, the [Fertilizer Research and Education Program](#), which is administered by the California Department of Food and Agriculture, provided financial support for some research aimed at determining the nutrient requirements of some representative nursery crops. The crops were grown with ample amounts of fertilizer, after which the amount of nitrogen, phosphorus, and potassium in shoots and roots was measured (fig. 1). While the plants were growing, their total water use was also measured. In the end, we could calculate how much of each nutrient was taken up by the plants, as well as how much water they took up.

Growers who apply dry fertilizers, such as controlled-release products, should use table 1, which presents the amount of nitrogen, phosphorus, and potassium taken up by 69 nursery crops. The values represent ounces of each element per 1,000 plants. The container size and number of days of production are also given. Although the list represents a small fraction of all nursery crops, our hope is that growers can estimate the nutrient needs of their crops based on those in this list that have similar growth characteristics. The values for phosphorus and potassium are presented as both the actual amounts needed and the amounts of P_2O_5 or K_2O , which are how they are usually presented in the analyses of commercial fertilizers.

Table 2 is intended for growers who inject fertilizers into irrigation water. For table 2, we divided the amount of fertilizer taken up by each crop by the amount of water it used during the cropping period. The resulting number represents a reasonable estimate of the appropriate concentration of each element in a liquid feed to satisfy the nutrient requirements of the crop.

It is worth noting that the amount of fertilizer required varies greatly by crop. For example, *Hypericum calycinum* took up about 41 ounces of nitrogen in the same amount of time that *Imperata cylindrica* took up 5 ounces. In contrast, the ratio of nutrient and water uptake did not vary nearly as much, so some generalizations about appropriate liquid feed concentrations are possible. In most cases, woody species should receive adequate nutrition from a liquid feed containing nitrogen levels of 50 parts per million [ppm, or mg/L (milligrams per liter)], 20 ppm phosphorus, and 50 ppm potassium. Most herbaceous species require about 100-150 ppm nitrogen, 20 ppm phosphorus, and 120-150 ppm potassium.

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Fig. 1. A variety of representative nursery crops were grown under optimum conditions to determine their nutrient uptake and water use.

Table 1. Nutrient requirements of representative nursery crops. Values are given in ounces of nutrient per 1,000 plants. P₂O₅ and K₂O are the rates for phosphorus and potassium, expressed in the units used for commercial fertilizer analyses.

Species	Size	Days	N	P	P ₂ O ₅	K	K ₂ O
<i>Acer palmatum</i>	1 gal	109	4.2	1.2	2.7	3.8	4.6
<i>Acorus gramineus</i> 'Ogon'	1 gal	182	18.6	1.9	4.3	25	30.1
<i>Angelonia angustifolia</i>	1 Quart Square	45	6.5	2.1	4.8	11	13.3
<i>Aptenia cordifolia</i>	1 gal	40	27.2	9	20.5	63.6	76.6
<i>Argyranthemum frutescens</i> 'Bright Carmine'	1 gal	47	21.4	6.1	13.9	39.6	47.7
<i>Armeria maritima</i>	1 gal	81	8.9	2	4.5	16.6	20
<i>Buxus microphylla</i> 'Winter Gem'	1 gal	150	10.2	1.2	2.7	9.6	11.6
<i>Calibrachoa</i> 'Super Bells Red'	1 Quart Square	45	13.8	1.6	3.6	9.5	11.4
<i>Capsicum annuum</i> 'Sweet California Wonder'	4 inch Round	42	9.4	1.3	3	8.9	10.7
<i>Coleus</i> 'Tilt A Whirl'	4 inch Round	42	23.1	3	6.8	24	28.9
<i>Coreopsis auriculata nana</i>	1 gal	60	20.5	2.5	5.7	13.8	16.6
<i>Coreopsis grandiflora</i> 'Early Sunrise'	1 gal	96	13.3	2.2	5	13.9	16.7
<i>Cosmos bipinnatus</i> 'Sonata Pink'	4 inch Round	42	17.1	3	6.8	24.6	29.6
<i>Cuphea hyssopifolia</i> 'Lavender Lace'	2 Quart Square	57	35.2	8.5	19.3	59.6	71.8
<i>Dianthus</i> 'Wink'	1 gal	98	31.1	4.6	10.5	36.3	43.7
<i>Dianthus deltoides</i>	1 gal	84	4.6	0.8	1.8	2.6	3.1
<i>Diascia integrifolia</i>	1 gal	60	2.8	0.7	1.6	2.4	2.9
<i>Dietes vegeta</i>	1 gal	183	17.5	6.5	14.8	21.9	26.4
<i>Echinacea purpurea</i> 'Magnus'	2 Quart Square	57	19.7	3.2	7.3	22.9	27.6
<i>Euonymus fortunei</i> 'Gracilis'	1 gal	109	4.5	0.6	1.4	5.2	6.3
<i>Euonymus fortunei</i> 'Green and Gold'	1 gal	148	17.1	2.4	5.5	18.9	22.8
<i>Euryops pectinatus</i> 'Viridis'	1 gal	69	9.6	2.3	5.2	8.5	10.2
<i>Gazania</i> 'Majestic Yellow'	1 gal	40	13.1	2.1	4.8	9.9	11.9
<i>Hedera helix</i>	2 Quart Square	57	27.5	4.4	10	40.6	48.9
<i>Hemerocallis</i> 'Stella de Oro'	1 gal	68	23.4	3.8	8.6	40.5	48.8
<i>Heuchera sanguinea</i>	1 gal	92	3.8	0.6	1.4	4.4	5.3
<i>Hydrangea macrophylla</i> 'Nikko Blue'	1 gal	182	44.1	7.4	16.8	47	56.6
<i>Hypericum calycinum</i>	1 gal	76	40.9	5.8	13.2	33.4	40.2
<i>Hypoestes phyllostachya</i> 'Red Splash Select'	1 gal	92	16	1.3	3	16	19.3
<i>Iberis sempervirens</i> 'Snowflake'	2 Quart Square	57	24.4	4.6	10.5	26.5	31.9
<i>Ilex aquifolium</i> 'San Gabriel'	1 gal	150	22.4	3.6	8.2	28.2	34
<i>Impatiens hawkeri</i> 'Bonfire Orange'	4 inch Round	42	8.2	0.8	1.8	7.6	9.2
<i>Impatiens walleriana</i> 'Double Ole Rose'	4 inch Round	42	12.7	2.1	4.8	16.4	19.8
<i>Imperata cylindrica</i> 'Red Baron'	1 gal	76	5.2	0.9	2	4.4	5.3
<i>Kniphofia</i> 'Border Ballet'	2 Quart Square	57	19.4	1.2	2.7	9.8	11.8
<i>Lagerstroemia indica</i> 'Petite Orchid'	1 gal	54	8.8	2.7	6.1	16.4	19.8
<i>Lavandula angustifolia</i> 'Munstead'	1 Quart Square	45	13.9	1	2.3	16.5	19.9
<i>Lavandula dentata</i>	1 gal	183	25.7	5.9	13.4	23.6	28.4
<i>Ligustrum japonicum</i> 'Texanum'	1 gal	68	20	1.3	3	18.7	22.5
<i>Miscanthus sinensis</i> 'Purpureus'	1 gal	81	6.5	0.8	1.8	8.1	9.8
<i>Nandina domestica</i>	1 gal	182	21.3	1.9	4.3	19.4	23.4
<i>Nepeta X faassenii</i> 'Dropmore'	1 Quart Square	45	13.4	1.9	4.3	12.5	15.1
<i>Ophiopogon japonicus</i>	1 gal	110	10.6	1.7	3.9	11.1	13.4
<i>Osteospermum</i> 'Sunny Mary'	1 gal	71	14.8	1.3	3	8.3	10
<i>Pachysandra terminalis</i>	1 gal	82	28.3	3.2	7.3	26.3	31.7
<i>Parthenocissus quinquefolia</i>	1 gal	47	2.7	0.4	0.9	1.9	2.3
<i>Pelargonium X hortorum</i> 'Flamingo'	1 gal	42	38.8	7.5	17	52.6	63.4
<i>Penstemon X mexicali</i> 'Red Rocks'	1 Quart Square	45	17.1	2.9	6.6	20.5	24.7
<i>Perovskia atriplicifolia</i>	1 Quart Square	45	18.2	7.1	16.1	16.7	20.1
<i>Phalaris arundinacea</i> 'Strawberries and Cream'	1 gal	40	9.3	4.4	10	23	27.7
<i>Prunus laurocerasus</i> 'Zabeliana'	1 gal	150	9	1.7	3.9	9.2	11.1
<i>Pyracantha coccinea</i> 'Low Boy'	1 gal	54	15.7	2.5	5.7	18.3	22
<i>Pyracantha koidzumii</i> 'Waldneri Prostrata'	1 gal	122	34.6	7.6	17.3	45.3	54.6
<i>Raphiolepis indica</i> 'Pink Lady'	1 gal	122	21.2	4.2	9.5	14.8	17.8
<i>Rhododendron</i> 'Remembrance'	1 gal	110	17	1.3	3	11.8	14.2
<i>Rosa</i> 'The Fairy'	1 gal	54	23.7	2.2	5	17.6	21.2
<i>Rosmarinus officinalis</i> 'Prostratus'	1 gal	76	14.2	1.7	3.9	16.4	19.8
<i>Rudbeckia fulgida</i> 'Goldsturm'	2 Quart Square	57	6.2	1.2	2.7	5.8	7
<i>Salvia greggii</i> 'Wild Thing'	1 gal	47	17.5	1.5	3.4	13.5	16.3
<i>Salvia leucantha</i> 'Santa Barbara'	1 gal	54	27.6	5.9	13.4	38.9	46.9
<i>Sedum spurium</i> 'Fuldaglut'	2 Quart Square	57	25.1	3.8	8.6	36	43.4
<i>Spiraea japonica</i> 'Neon Flash'	1 gal	47	22.4	3.1	7	28.2	34
<i>Stachys byzantina</i> 'Silver Carpet'	2 Quart Square	57	15.6	2.9	6.6	21.3	25.7
<i>Thuja</i> 'Green Giant'	1 gal	88	10.1	0.8	1.8	7.2	8.7
<i>Trachelospermum asiaticum</i>	1 gal	110	12.3	2.5	5.7	10.9	13.1
<i>Verbena peruviana</i> 'Red Devil'	1 gal	54	45.2	6.6	15	51.7	62.3
<i>Viburnum suspensum</i>	1 gal	91	9.3	2.2	5	10.6	12.8
<i>Vinca minor</i> 'Bowles'	1 gal	79	8.9	1.2	2.7	10.1	12.2
<i>Weigela florida</i> 'Variegata Nana'	1 gal	182	19.6	3	6.8	18.7	22.5

Table 2. Recommended liquid feed concentrations for nursery crops.

		Water use (L)	Recommended liquid feed concentrations		
			[N] (ppm)	[P] (ppm)	[K] (ppm)
Species	Days				
<i>Acer palmatum</i>	109	4.7	25	8	23
<i>Angelonia angustifolia</i>	45	3.4	116	17	92
<i>Aptenia cordifolia</i>	40	11.3	68	23	160
<i>Argyranthemum frutescens</i> 'Bright Carmine'	47	5.6	107	31	199
<i>Armeria maritima</i>	81	8.6	29	6	55
<i>Berberis thunbergii</i> 'Crimson Pygmy'	88	7.8	38	5	36
<i>Buxus microphylla</i> 'Winter Gem'	150	12.1	32	3	23
<i>Calibrachoa</i> 'Superbells Red'	45	2.7	97	13	83
<i>Capsicum annuum</i> 'Sweet California Wonder'	42	2.9	223	29	232
<i>Caryopteris X clandonensis</i> 'Longwood Blue'	45	3.2	184	23	127
<i>Coleus</i> 'Tilt A Whirl'	42	2.1	179	29	186
<i>Coreopsis auriculata nana</i>	60	5.6	88	15	125
<i>Coreopsis grandiflora</i> 'Early Sunrise'	96	11.2	89	22	150
<i>Cosmos</i> 'Sonata Pink'	42	3.5	253	37	295
<i>Cuphea hyssopifolia</i> 'Lavender Lace'	57	2.9	45	7	25
<i>Dianthus</i> 'Wink'	98	3	25	7	23
<i>Dianthus deltoides</i>	84	7.8	64	24	80
<i>Diascia integrifolia</i>	60	8.2	68	11	79
<i>Echinacea purpurea</i>	57	4.3	112	16	123
<i>Euonymus fortunei</i> 'Gracilis'	109	5.9	45	11	40
<i>Euonymus fortunei</i> 'Green and Gold'	148	12.6	29	4	22
<i>Euryops pectinatus</i> 'Viridis'	69	9.3	83	13	123
<i>Gazania</i> 'Majestic Yellow'	40	10.1	66	11	114
<i>Hedera helix</i> 'Thorndale'	57	2.3	48	8	55
<i>Heemerocallis</i> 'Stella de Oro'	68	8.9	140	24	149
<i>Heuchera sanguinea</i>	92	10.8	108	16	88
<i>Hypericum calycinum</i>	76	16.6	42	8	45
<i>Hypoestes phyllostachya</i> 'Red Splash Select'	92	6.7	94	15	119
<i>Iberis sempervirens</i> 'Snowflake'	57	3.3	70	7	66
<i>Ilex aquifolium</i> 'San Gabriel'	150	14.1	26	4	33
<i>Impatiens hawkeri</i> 'Bonfire Orange'	42	1.6	93	16	79
<i>Impatiens walleriana</i> 'Double Ole Rose'	42	3.9	142	33	167
<i>Imperata cylindrica</i> 'Red Baron'	76	9	28	8	52
<i>Kniphofia</i> 'Border Ballet'	57	3.3	119	9	143
<i>Lagerstroemia indica</i> 'Petite Orchid'	54	11.3	65	15	59
<i>Lavendula angustifolia</i> 'Munstead'	183	2.1	87	11	107
<i>Ligustrum japonicum</i> 'Texanum'	68	7.4	51	7	48
<i>Miscanthus sinensis</i> 'Purpureus'	81	9.9	30	5	31
<i>Nepeta X faassenii</i> 'Dropmore'	45	3.6	224	25	208
<i>Ophiopogon japonicus</i>	110	3.6	22	4	17
<i>Osteospermum</i> 'Sunny Mary'	71	9.8	112	22	152
<i>Pachysandra terminalis</i>	82	7.7	62	11	76
<i>Parthenocissus quinquefolia</i>	47	8	65	25	59
<i>Pelargonium X hortorum</i> 'Flamingo'	42	1.7	158	21	165
<i>Penstemon X mexicali</i> 'Red Rocks'	45	2.7	93	18	95
<i>Perovskia atriplicifolia</i>	45	3.4	130	21	151
<i>Phalaris arundinacea</i> 'Strawberries and Cream'	40	15.9	62	13	81
<i>Prunus laurocerasus</i> 'Zabeliana'	150	15	40	8	28
<i>Pyracantha coccinea</i> 'Low Boy'	54	8	60	5	42
<i>Pyracantha koidzumii</i> 'Walden Prostrata'	122	15.2	45	4	33
<i>Rhaphiolepis indica</i> 'Pink Lady'	122	13	31	4	36
<i>Rhododendron</i> 'Remembrance'	110	5.5	32	5	31
<i>Rosa</i> 'The Fairy'	54	8.6	58	5	44
<i>Rosmarinus officinalis</i> 'Prostratus'	76	15.9	49	10	69
<i>Rudbeckia fulgida</i> 'Goldsturm'	57	4.6	156	24	223
<i>Salvia greggii</i> 'Wild Thing'	47	7.6	83	11	105
<i>Salvia leucantha</i> 'Santa Barbara'	54	6.1	73	13	99
<i>Sedum spurium</i> 'Fuldaglut'	57	2.1	136	11	99
<i>Spiraea japonica</i> 'Neon Flash'	47	6.3	55	11	49
<i>Stachys byzantina</i> 'Silver Carpet'	57	6.4	199	29	227
<i>Thuja</i> 'Green Giant'	88	8.1	32	7	37
<i>Trachelospermum asiaticum</i>	110	5.7	44	6	51
<i>Verbena peruviana</i> 'Red Devil'	54	5.4	102	16	97
<i>Viburnum suspensum</i>	91	6.6	62	15	82
<i>Vinca minor</i> 'Bowles'	79	4.6	63	11	69

The Australian ornamental production industry: How things work down under

by Julie Newman

During my sabbatical leave, I had an opportunity to visit with staff at the Nursery and Garden Industry Association, Queensland and tour a number of nurseries in the Brisbane-Gold Coast area of Australia. Queensland is located in the northeast area of Australia and Brisbane is located along the southeastern coastal part of the state. The Australian nursery industry is surprisingly similar to the California industry in terms of industry issues and production practices. However, organization of the industry and the way extension service is delivered is considerably different. In this issue of UCNFA News, I will share some of the things that I learned about the Australian ornamental production industry, as well as how Aussies are addressing the water issue (see my *Regional Report*). Additional information will be presented in the next newsletter issue.

The horticulture production industry in Australia includes fruits, vegetables, nuts, nursery products, cut flowers and turf; it is the third largest and fastest growing agricultural industry (only the grain and meat industries are worth more). The greatest volume of nursery production is concentrated in the eastern States, primarily in New South Wales, Victoria and Queensland. The climate along the south coast, where the majority of the population resides, is conducive to the production of a broad palette of plants, similar to coastal California. Nursery crop categories include bedding plants and color, bulbs and seeds, indoor and patio plants, propagation stock, and trees and shrubs.

Production nurseries in Australia sell plant material predominately to domestic markets (exports are less than 1% of total production). Major market sectors are garden centers and retail nurseries, landscapers, production horticulturists, other nurseries, wholesale markets and revegetation groups such as [Greening Australia](#). The size of the entire Australian nursery production industry is relatively small compared to California: The wholesale value of nursery plant material sold in Australia in 2009 was 921 million U.S. dollars (USD), whereas California production in 2008 was about 3.5 billion USD. However, despite the smaller size, the Australian industry association's tightly organized structure and broad base of members and cooperators enables it to effectively gather the funds and resources needed to work proactively to



Fig. 1. The Queensland greenhouse and nursery industry is valued at more than 450 million USD and is located predominantly along the coastline, with pockets of producers situated in various inland locations. The bulk of production is in the southeast corner of the state where approximately 70% - 80% of these crops are produced.

address challenges that are very similar to those faced by nursery growers here in California. Examples of Australian programs that address industry issues include accredited and certified BMP and "green" programs (see my *Regional Report*) and the industry's certified biosecurity program.

Turf production and cut flowers are separate horticulture production industries in Australia. Turf production currently has a farm gate value of 431 million USD (California value was 505 million USD in 2008). For cut flowers, statistics are not readily available, but for the two largest growing areas, the farm gate value was estimated at 194 million USD in New South Wales (2003) and 120 million USD (2008) in Queensland (California value was 505 million USD in 2008). Cut flower growers produce traditional cut flowers, especially roses, lilies and gerberas. Chrysanthemums are produced for Mother's Day, and seasonal bulbs and flowers in the spring. Most traditional flowers are grown with some protection, commonly in poly tunnels, and are sold on the domestic market. Australian wildflowers—native flowers and foliage and South African flowers in the Proteaceae—are primarily cultivated in

plantations and account for 90% of the industry's exports. These include filler flowers such as waxflower and kangaroo paws and seasonal focal flowers such as banksia and protea. Some flowers and foliage are wild-harvested under license.

Agricultural extension

Unlike the United States, state departments of agriculture, rather than land grant universities, are the major public providers of agricultural services in Australia, and these programs have historically had a strong emphasis on production-based technology transfer. However, in most states in Australia, cutbacks in funding from state governments and changing policies about the role of government have put pressure on state departments of agriculture to review and restructure, which has affected the nature of the services they provide and the ways that those services are provided. The changing agricultural extension environment in Australia reflects a worldwide trend towards the privatization of agricultural extension services.

Currently, private Research and Development Corporations (RDCs) are taking a proactive role in extension. The RDCs work with a diverse group of extension players, including farmer organizations, cooperatives, supply and chemical companies, multinational corporations, marketing boards, cooperative research centers, university departments and state departments of agriculture to collect funds and invest in extension programs in which all these groups play a role. Rather than an emphasis on research-based extension programs (“research-push”), the extension programs in Australia are more “demand-pull,” so that growers have more control of the information that they need or want and the way it is delivered—at a cost largely shared by industry. This type of extension model has both advantages and disadvantages that are too complex and lengthy to present here. A good discussion is provided by Marsh and Pannell (1998) and can be reviewed at www.general.uwa.edu.au/u/dpannell/dpap982f.htm.

Industry organizations

The Nursery and Garden Industry, Australia (NGIA)

NGIA is a national organization for businesses that produce and sell plants and container media for gardens and landscapes. NGIA works jointly with seven state and territory Nursery and Garden Industry (NGI) associations to accomplish their mission of providing a united and sustainable industry. Membership fees depend on the number of employees and range from 575-2,208 USD. (As comparison, membership fees for CANGC are based on annual sales and range from 300-9,000 USD.) Funding for the nursery and garden industry for marketing and research and development (R&D) is provided by industry levies, voluntary contributions and government subsidies. The *nursery products levy*, also referred to as the “pot levy,” is payable on all containers in which plants are grown for resale, including plastic bags, root control bags and biodegradable pots. The levy is currently set at 5% of the wholesale value of the container and is collected at the point of purchase of the containers. Annual levy collections for the nursery industry total nearly 2 million USD, and when matched by the Commonwealth Government, is close to 3 million USD. The levy program funds more than 20 programs ranging from technical studies to consumer promotions. In addition to these levy-funded programs, matching

Commonwealth funds are provided for an extensive list of other programs.

Horticulture Australia Limited (HAL). HAL is a national non-profit, industry-owned RDC that works in partnership with the entire horticulture industry to invest in R&D and marketing programs that provide benefit to horticulture and the wider community. HAL invests approximately \$86 million USD annually in projects and runs more than 1200 R&D and marketing projects covering a wide range of topics. HAL conducts some activities within the marketing program, but most activities are contracted out to other organizations such as state departments of agriculture, universities, and the Commonwealth Scientific and Industrial Research Organization (CSIRO), Australia’s national science agency. Industry groups working with HAL can access matching Government Commonwealth funds for R&D activities. Horticulture industry advisory committees, consisting of representatives nominated by industry from a broad range of expertise, provide direction and advice to HAL on the most appropriate use of funds to ensure maximum industry benefit.

The levy program for the nursery industry is facilitated by HAL in collaboration with NGIA and the state nursery and garden associations. A key levy-funded program which is supported by HAL and is complimentary to all nursery industry businesses is the employment of an Industry Development Officer (IDO) in each State/Territory association. Some state associations have multiple IDOs (e.g., Queensland). The main role of the IDO is to provide advice to all sectors of the nursery and garden industry relating to technical, environmental and horticultural issues. The IDO functions in a similar capacity to the farm advisor or NRCS field representative in technical on-site assistance and links with researchers. The IDO also represents the industry with state government agencies to ensure that the industry is considered in key issues.

Another key levy-funded resource for nursery growers supported by HAL is the employment of a Business Skills Development Officer (BSBO) in six of the seven State/Territory association offices. The BSBO helps growers achieve industry business accreditation and provides a link for financial management, human resources issues and training industry programs. The BSBO also gives advice and helps growers improve every aspect of the

business, including administration and marketing.

HAL also works with the nursery and garden industry in developing strategic plans, preparing annual programs, and facilitating linkages between the nursery and garden industry and other horticultural industries and agencies. Furthermore, HAL provides IDOs and R&D services for the turf and floriculture industries.

The Flower Association of Queensland Inc (FAQI) and National Flower Working Group

FAQI represents Queensland floriculture greenhouse growers, growers of tropical flowers and foliage, and in-ground native and wildflower growers. Members also include equipment and installation suppliers, wholesalers, exporters, florists, specialist consultants and advisors, researchers and educators. FAQI proactively addresses common challenges, implements solutions and represents its members to government, technical agencies and other industry groups. Membership fee is dependent on the number of employees and is less for new members (87-408 USD). FAQI works primarily with the Queensland Government and industry groups to fund activities and is staffed with one IDO. The floral industry in Australia is somewhat fragmented. However FAQI has begun a process to coordinate efforts with representatives from New South Wales, Queensland and Victoria with HAL to form the National Flower Working Group (NFWG) to address national efforts.

Turf Producers Australia Ltd (TPA). TPA is the national representative body of the turf industry. TPA includes four state associations, and the state association for Queensland has one IDO. Membership is a flat annual fee (408 USD). R&D programs are administered through HAL with a levy program that works in a similar manner as the NGIA. The levy is collected from all turf growers that produce over 20,000 square meters (m²) of turf (approximately 215,278 square feet); these growers annually pay a 1.5 cent per m² industry levy which is matched by the government for R&D.

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CAMPUS NEWS AND RESEARCH UPDATES

compiled by Deborah Mathews

Lily research for better nematode control using natural compounds

Deborah Giraud, UC Cooperative Extension (UCCE) Farm Advisor in Humboldt and Del Norte Counties, attended the [International Society for Horticultural Science 2nd International Symposium on Genus Lilium](#) last August in Italy. She presented a poster and paper on the nematode control work she and Dr. Becky Westerdahl, UCCE Specialist at UC Davis, have been conducting on Easter lilies at the research station in Smith River for many years. The symposium had eight tracks: botany, agronomy, genetics, physiology, breeding, postharvest, pathology and propagation. Presenters represented many countries including Japan, Korea, China, Iran, the Netherlands, Russia, Israel and Italy. Topics included issues related to many species and hybrids, production techniques and much more. Giraud and Westerdahl's paper was titled "New Products to Improve Growth of Field-Grown Easter Lily Bulbs." Field-grown bulbs require both preplant and current season controls for pathogens caused by fungi and nematodes in order to propagate salable bulbs within a three year-period. The authors tested many natural products such as sesame seed oil, meadowfoam seed meal, mustard bran, soapbark tree bark (*Quillaja*), DiTera fungal toxin, and two fungi *Paecilomyces* and *Muscodor* alongside commercial standard nematicide products. The parameters measured were bulb circumference to indicate growth, ratings of root health, measurements of nematode presence, and ten other criteria of interest to the growers. Untreated controls were tested as well, and not hard to beat, as growing field-grown bulbs with no controls for root-lesion nematodes (*Pratylenchus* spp.) resulted in very poor, unsalable bulbs. Twenty-six treatments were equivalent to one or both of the commercial standards but some preplant soil treatments were still necessary. When used alone, the natural products tested did not perform well enough to replace a commercial standard. For the full paper, please email ddgiraud@ucdavis.edu or bbwesterdahl@ucdavis.edu.

Using solar power to its full advantage atop shadehouses

Dr. Heiner Lieth at UC Davis is currently researching the feasibility of a new shadehouse technology for the container nursery industry. This is based on solar panel technology developed by [Solyndra \(Fremont, California\)](#) consisting of photovoltaic (PV) tubes arrayed as panels. Such panels are designed for installation on flat-roofed commercial buildings where they produce electricity when sunshine strikes them. The panels are installed with the tubes aligned north-south so that they passively track the sun and no mounting hardware is needed to articulate the panels. Dr. Lieth noted that if the gap between the tubes could be made a bit wider than in the customary panel products, the panels might let enough light through to allow plants to grow underneath them. Solyndra is currently funding research at UC Davis to test the feasibility of using this technology to produce shade while still providing plants with adequate light to grow and producing electricity to run various functions. To investigate if plants grow differently under the new PV technology in contrast with conventional shade systems, a shadehouse was recently built at UC Davis consisting of three shade treatments. Early results show that the technology is feasible for nursery

growers and that for some crops (e.g. citrus) the photosynthetic patterns suggest that growth may actually be better under the photovoltaic shade system compared with conventional shade cloth systems. For more information, contact Dr. Lieth at jhlieth@ucdavis.edu.

Dr. Deborah Mathews to speak at the Society of American Florists meeting in San Diego

Dr. Deborah Mathews, UCCE Specialist in Plant Pathology/Ornamental Crops at UC Riverside has been invited to speak on Feb. 25, 2011 at the Society of American Florist (SAF) 27th Annual Pest and Disease Management Conference. The meeting will take place on Feb. 24-26 at the San Diego Marriott Mission Valley hotel, located at 8757 Rio San Diego Drive in San Diego, California. The conference features two days of educational sessions led by top experts, a table-top trade show of the latest tools and products, and an optional tour of local growing operations. For more information or to register, visit the SAF website at <http://www.safnow.org/>.

Dr. Deborah Mathews is UC Cooperative Extension Specialist in Plant Pathology, Department of Plant Pathology and Microbiology, UC Riverside.



Shadehouse at UC Davis with sections constructed using conventional shade cloth or Solyndra photovoltaic panels to evaluate plant growth under these different types of shade.

REGIONAL REPORT- UC Cooperative Extension San Benito/Santa Clara counties

The 2010 California spring trials

by Maria de la Fuente, PhD

Each year folks from the trade magazine *Greenhouse Product News (GPN)* head west for an intense week of visiting new-variety trials along the California coast. The trials for 2010 took place last April 10 to 17. I decided to take three days to make the 2010 Spring Trials trip, covering the northern part of the exhibits around the Monterey Bay. It could have been a bit hectic since I was driving from city to city and trial to trial, but since I went back home every night, it was possible for me to get relaxed and stay organized. GPN put together an excellent companion guide that helped me survive the visits. When I planned my trip I contacted the companies using the well-organized information provided on their websites, so it was a matter of keeping my appointments and following my own schedule. GPN and the companies' staff were always ready to welcome me, and at every site they provided me with a name tag and nice refreshments, as well as information and useful tools. I was also invited to a couple of working lunches, so besides enjoying it a lot, I learned plenty.

The trials had many sponsors and several company sites in each area that I visited. In the Gilroy area, I visited trials featuring varieties from Danzinger, Oro Farms, Syngenta Flowers, Goldsmith Seeds, Goldfish and Yoder. I learned that Goldsmith, Goldfish and Yoder had merged with Syngenta, so they all showed at the same site and it was very impressive. In the San Juan Bautista area, I visited Speedling that hosted Greenex, Hem Genetics, Schoneveld Breeding, Thompson & Morgan and the incredible collection of labeling aids of MasterTag. In the Watsonville area, I



At American Takii, the ornamental cruciferous crops took my breath away.

toured Golden State Bulb Growers, Pacific Plug and Liner, and Agrexco (featuring Cohen Propagation Nurseries, Hishtil Nurseries, Isaacson Flowers, Jaldety Nursery and Schwartz Nursery). Lastly in Salinas, I visited the American Takii Company that was also celebrating its 175th anniversary this year.

If I had the time and resources, believe me, I would have traveled to the three remaining regions, which included the cities of San Luis Obispo, Arroyo Grande, Lompoc, Santa Barbara, Carpinteria, Santa Paula, Oxnard, Bonsall, Vista and Encinitas.

The third day into my trip, I had the good fortune to ride along with our former UC Cooperative Extension (UCCE) Santa Clara County Master Gardener Program Coordinator, Carole Frost, who certainly was a lot more knowledgeable than I regarding common and scientific names of the specimens on display. It's going to take hard work for me to accumulate the knowledge that she has, so for that day, she was certainly instrumental in my learning process.

This was a completely new way to look at Spring Trials. Most companies went through the first-ever retail idea center, featuring hundreds of ways to grow retailers' businesses. There were large outdoor crop displays, completely redesigned areas with aesthetically pleasant landscape displays and many varieties, breeders, and inspirational décor ideas. They included comprehensive culture research presentations and all the amenities to enjoy our stay. Some companies provided me with a research staff person that showed me programs and gave me presentations tailored to my research interest. Also the new post-show online scrapbook at www.ballhort.com/springtrials gave me the opportunity to check and enjoy the highlights, view photo galleries, and read reviews, especially for the places I missed.

Most companies of course, had their set of "goodies" to give away, but I was content to receive their catalogs that helped me during the tours with my steep learning curve regarding variety identification.

It would be impossible to describe all that I learned and saw during my trip, but I will share some highlights, keeping in mind that



Most companies went through the first-ever retail idea center, featuring hundreds of ways to grow retailers' businesses.

the story begins with a breeder and ends with a happy gardener. At [American Takii](#) the ornamental cruciferous crops took my breath away; besides beautiful and top-of-the-line show greenhouses, they had a fantastic walking path showing annuals, ornamental grasses, perennials, pot crops, vegetables and trees. At [Pacific Plug and Liner](#) they displayed an in-depth comparative trial of morning glory and lavender, as well as a vegetative begonias trial. [Agrexco group](#) displayed an exciting array of vegetative annuals, perennials, geraniums, climbing vines and herbs; it was also a place where I heard many people speaking in Hebrew. I enjoyed [Hem Genetics](#)' beautiful naturally dwarf petunias and [Schoneveld Breeding](#)'s impressive hanging ornamental strawberries.

A number of stops held personal interest for me, being from Mexico. Dahlia is the national flower of Mexico and [Oro Farms](#) had the largest collection of dahlia varieties I have ever seen. Being a "chilehead," [Greenex](#) stole my heart with their display of ornamental chile peppers; [Golden State Bulb Growers](#) featured their beautiful calla lilies, including one variety that shared my name, 'Diva Maria'. ☺

I can't finish the article without talking about Syngenta. Goldsmith is a place that I visit every year for its beautiful outdoor fields.

The most striking part of their greenhouse display was the way they managed to arrange their varieties and the marketable name tags they group them with; also the interesting architectural and aesthetic color study, their theories and practices that were so new to my very scientific-guided mind. Yoder chrysanthemums grew fast into my heart since it was the first crop I did a research and education program on when I first came to California. The chrysanthemum growers in the San Francisco Bay Area (about 300 in the mid 90's), have almost disappeared. This includes the mum growers I worked with in Santa Clara County (today, there are only 15 left in this area).

If you missed the 2010 trials, GPN has extensive coverage in their magazine, but also is posting video reports of some of the breeders and exhibitors at [HortTV@Spring Trials on www.gpnmag.com](#).

Spring is around the corner, so don't miss the 2011 trials! This year's dates are March 26 - April 2, 2011. For more information, visit the California Spring Trials website at <http://www.packtrials.org/home.cfm>

All Pictures by Maria de la Fuente. The author wishes to express her thanks to Carole Frost, former UCCE Santa Clara County Master Gardener Program Coordinator, for her valuable input during this trip.



At Goldsmith (Syngenta), varieties were arranged in interesting architectural and aesthetic color studies.

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Karrie Reid named environmental horticulture advisor in San Joaquin County

excerpt from ANR Report December 2010 (Vol. 24, No.6)

Karrie Reid joined ANR as the environmental horticulture advisor for San Joaquin County on Nov. 1. A native of the Stockton area, Reid will be working with public agencies, private companies, the nursery industry, and the general public on horticultural issues most critical to our urban environments. She will focus on water conservation, reduction of pollutants in urban runoff, best management practices for landscape maintenance and nursery production, reduction of green waste production and landfill disposal, and mitigation of urban landscapes' negative impacts on neighboring non-urban environments (specifically the San Joaquin Delta watershed).

Prior to taking the Cooperative Extension position, Reid worked with Loren Oki, landscape horticulture specialist, in the UC Davis Department of Plant Sciences on two projects related to landscape water conservation and quality. On one of those projects, she ran irrigation and climate zone trials on landscape ornamental plants. In the other, she was looking at characterizing the constituents of urban runoff water from single-family homes and attempting to influence homeowner practices to mitigate the negative impacts to local waterways. Reid earned her bachelor's degree in general biology from UC Santa Cruz and her master's degree in plant science and ornamental horticulture from UC Davis.

Reid can be reached at (209) 953-6109 and skreid@ucdavis.edu. ♦



REGIONAL REPORT AND FIELD OBSERVATION- UC Cooperative Extension Santa Cruz/Monterey counties

European grapevine moth: a new major pest on grapes, now in Central California, with potential impact on the ornamental nursery industry

by Steve Tjosvold

In mid-September, Santa Clara County was added to the eight other California counties where European grapevine moths (EGVM) have been trapped and quarantines established. One moth was also found in Santa Cruz County, and intensified trapping currently underway will determine if a quarantine will be triggered there. The question now arises: what will the impact on the ornamental industry be?

The pest, *Lobesia botrana*, was first detected in the United States in the Napa Valley in October 2009. It is a serious pest of grape where it is found in Southern Europe, North Africa, Anatolia, the Caucasus and Chile. Larvae emerge early in the spring and feed on grape bud clusters or flowers and spin webbing around them. They pupate inside the web or under a rolled leaf. If heavy flower damage occurs during this first generation, the affected flowers will fail to develop and yield will be reduced. Second-generation larvae enter the grapes to feed before they pupate inside the grape. Larvae of the third generation — the most damaging — feed on multiple ripening grapes and expose them to further damage from fungal development and rot.

This pest feeds on many different plant families (approximately 27) but only a few species within each family may be suitable for development. Much of the knowledge on other hosts is from research and observation in Europe. For example, in Italy, olive trees offer satisfactory food for the larvae and could be a source of emerging and migrating moths that infest adjacent vineyards. A partial list of known hosts is listed below but little to no information is available in the scientific literature on the damage to these crops or how sufficient they are for insect development. This is the same list of hosts that are now regulated under federal and state quarantines (Table 1).

Although EGVM may not be a particularly damaging pest on ornamentals, it is feared that ornamentals may harbor the pest and move it with shipments on infested hosts. Federal and state quarantines stipulate that nurseries growing regulated hosts within



Jack Kelly Clark

Larvae of European grapevine moth, *Lobesia botrana*, have prominent white spots at the base of body hairs.

regulated areas must enter into a compliance agreement with authorities to ship those hosts outside of the quarantined area. Compliance agreements will stipulate specific measures to safeguard against the spread of any life stages of EGVM. The agreements are not unlike those that are currently in effect for Light Brown Apple Moth (LBAM). Both moths are in the same moth family (Tortricidae: leafrollers) and some of the same exclusion and management strategies are being implemented. Given the capability of this pest to feed on many hosts, it may extend its number of host species if given the opportunity.

Since it is not clear how important nursery hosts are to the movement of EGVM, for now regulatory authorities are emphasizing the control of the most obvious path of movement— on grape plants and fruit. Compliance agreements are mandated for production and retail nurseries within the quarantined areas to ship within and out of quarantined areas. Production nurseries are required to be inspected before the first shipment and thereafter every 30 days. An integrated pest management program targeting EGVM must be established and treatment records maintained. More

intensive management is necessary for grape and olive stock. For example, olive fruit and flowers would need to be removed, or chemically inhibited, or treated with an approved insecticide before shipment.

More information on identification, management and regulation is available at these links:

UC IPM: <http://www.ipm.ucdavis.edu/EXOTIC/eurograpevinemoth.html>

USDA APHIS: http://www.aphis.usda.gov/plant_health/plant_pest_info/eg_moth/index.shtml

CDFA: <http://www.cdfa.ca.gov/phpps/egvm/index.html>

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Jack Kelly Clark

The EGVM larva has dark markings on the outside, back edge of the prothoracic shield and dark thoracic legs.

Adult European grapevine moth, *Lobesia botrana*.

Table 1. Known hosts for the European grapevine moth

Scientific Name	Common Name
<i>Actinidia chinensis</i>	Kiwi fruit or Chinese Gooseberry
<i>Berberis vulgaris</i>	European Barberry
<i>Clematis vitalba</i>	Old-Man's-Beard or Traveler's Joy
<i>Daphne gnidium</i>	Spurge Flax
<i>Dianthus spp</i>	Carnation
<i>Diospyros kaki</i>	Persimmon
<i>Galium mollugo</i>	False Baby's Breath or White Bedstraw
<i>Hypericum calycinum</i>	St. John's Wort or Aaron's Beard
<i>Ligustrum vulgare</i>	European Privet
<i>Olea europea</i>	Olive
<i>Prunus spp.</i>	Stone Fruit (e.g., apricot, cherry, plum)
<i>Punica granatum</i>	Pomegranate
<i>Rhus glabra</i>	Smooth Sumac
<i>Ribes spp.</i>	Currant, Gooseberry
<i>Rosmarinus officinalis</i>	Rosemary
<i>Rubus spp</i>	Blackberry, Dewberry
<i>Silene vulgaris</i>	Bladder Campion
<i>Trifolium pretense</i>	Red Clover
<i>Urginea maritima</i>	Sea squill
<i>Vitis spp.</i>	Grape
<i>Ziziphus jujube</i>	Jujube



Jack Kelly Clark

Earlier stages of European grapevine moth larvae, *Lobesia botrana*, are tan to yellow-brown (top). Later stages become dark colored (bottom).

REGIONAL REPORT- UC Cooperative Extension Ventura/Santa Barbara counties

How Aussie nursery growers are addressing the water issue

by Julie Newman

Australia is considered the driest continent. Only about 26% of Australian agricultural products are irrigated crops, and these are produced on less than 1% of the land area dedicated to agriculture. Water supply is a significant factor limiting the size of irrigated agriculture because existing crops already use around 75% of Australia's water. Moreover, from 2001-2008, record-breaking drought conditions and water restrictions placed on users of urban water supplies led to a sharp decrease in domestic gardening activity across Australia and substantial declines in plant sales. Brisbane experienced one of the most severe droughts in over a century. Mandated water restrictions led to per capita water usage below 37 gallons per day and was one of the lowest of any Western city in the world (fig. 1).

Furthermore, irrigated agriculture has incurred significant environmental costs in some areas of Australia. Land and water degradation, excluding weeds and pests, has been estimated to cost up to 3.4 billion U.S. dollars (USD) annually. A third of Australia's rivers are in a degraded condition due to

high water extraction rates and high nutrient runoff from surrounding land.

The Nursery and Garden Industry, Australia, (NGIA) the national organization for the Australian nursery industry, recognizes that water issues have a major impact on the industry. As a result, NGIA has worked with many different types of organizations to implement programs that have resulted in improved irrigation efficiency, reduced runoff and increased customer awareness of plants that can be used to conserve water. In this issue of UCNFA News, I will describe a few of these programs.

NIASA

The accreditation program for production nurseries and growing media—[Nursery Industry Accreditation Scheme Australia \(NIASA\)](#)—is a national scheme for production nurseries and growing media suppliers which operate in accordance with a set of national "best management practice" (BMP) guidelines. The BMP guidelines were developed over a period of years by industry representatives and researchers

and are financially supported by the national Research and Development program. A wide range of issues are covered in this scheme which includes sanitation practices, crop management practices (including plant nutrition, pest management and irrigation practices) and general site management. The guidelines continue to evolve and are reviewed annually to make sure they remain relevant.

Any wholesale/production nursery or growing media/potting mix manufacturer in Australia can join NIASA if they implement the NIASA BMP Guidelines. Membership is voluntary and participants are not required to belong to a nursery and garden industry association but must comply with the NIASA Accreditation audit. All NIASA accredited businesses are audited at least annually by Industry Development Officers (IDOs) who are based across the country. Growers that implement these BMPs have demonstrated reduction in water use, runoff and leaching. Benefits of implementing these practices also include access to technical assistance; reduced costs through improved production practices; increased marketplace recognition and customer confidence (many government departments and large landscape contractors prefer to buy from NIASA nurseries); improved knowledge, skills and professionalism; reduced occupational health and safety issues; and a positive public image due the demonstrated commitment to efficient and environmentally conscious management practices.

EcoHort

With environmental issues becoming increasingly prominent both locally and globally, sound environmental practice is rapidly gaining importance for Australian agricultural businesses. Growers must demonstrate to industry, government and the community their sound environmental stewardship and compliance with the diverse range of environmental legislation, including water quality regulations. Growers of Australian agricultural commodities have adopted industry-specific environmental management (EMS) programs to assess and improve their environmental performance on their own farms. These programs develop farming systems which have minimal off-site



Fig. 1. Brisbane recently made headlines when flooding due to unprecedented rainfall occurred over much of the northeast Australian state of Queensland. However, during record-breaking drought conditions from 2001-2008, Brisbane gardens, landscapes and city parks were mandated by local regulations to observe stringent water restrictions. This had a drastic effect on the economy of the nursery industry.

impacts—unintended negative consequences which affect someone else; for example another farmer or future generations, or a threatened ecosystem or species. Adoption of these practices demonstrates that runoff containing pollutants such as pesticides and nutrients are not an issue; it also demonstrates that pests are properly controlled with no loss to biodiversity in surrounding areas.

To demonstrate minimal off-site impacts, farming systems need to achieve minimal leaching of nutrients to the groundwater; negligible wind and water erosion; no persistent toxicities (acidity, heavy metals, agrochemicals); control of pests, diseases and weeds; and no loss of biodiversity in surrounding areas. Self-audits of the EMS show if the required management actions are occurring and where improvements can be made. Growers may also choose to undergo a third-party certification audit to have claims of environmental responsibility independently assessed. This can be compliant with ISO 14001, the internationally accepted standard.

EcoHort is the industry-specific EMS for production nurseries and growing media businesses. The program builds on the

NIASA module and presents businesses with recognition for their efforts in rising to the environmental challenge. To gain formal EcoHort certification, a business must first achieve NIASA accreditation.

Smart Approved WaterMark

NIASA guidelines and EcoHort are approved by Smart Approved WaterMark. **Smart Approved WaterMark** is Australia's leading labeling scheme for products and services that help reduce water use outdoors and around households across Australia. The Smart Approved WaterMark scheme was created in response to the national objective of reducing per-capita water consumption. The purpose of the scheme is to reduce water consumption through the promotion of products and services that help conserve water use. The scheme was established by four associations: the Australian Water Association, the Irrigation Association of Australia, the Water Services Association of Australia, and the Nursery and Garden Industry, Australia. The Australian Government supports Smart WaterMark with a grant to promote the scheme to the Australian public. States and Territories have agreed to give preference to

Smart WaterMark endorsed products when offering rebates, and to include the WaterMark in broader water policy mechanisms. The Smart WaterMark logo (fig. 2) can be used by NIASA businesses when referring to NIASA accreditation, including marketing and advertising materials, web sites, and corporate stationery and signage.



Fig. 2. Smart Approved WaterMark is Australia's outdoor water saving labeling program for products and services that help to reduce water use around the home.

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UCNFA Proposed Educational Programs for 2011

The Program Planning Committee of the University of California Nursery and Floriculture Alliance (UCNFA) is in the process of planning a full schedule of educational programs for growers during 2011:

January thru May 2011

Photovoltaic Shade House Technology (UC Davis)
Photovoltaic Shade House Technology (Watsonville, Salinas or Hollister)
Photovoltaic Shade House Technology (Vista/San Marcos)
Nursery Risk Management (Carpinteria)

June thru August 2011

IPM Scouting Program (Watsonville area nursery)
Monitoring/Scouting Program (Vista/San Marcos)

September thru December 2011

Insect Biocontrol Symposium
California Nursery Conference (Ontario)
Water Quality Meeting (Ventura or LA County)
Spanish ABCs of Horticulture or ABCs of Fertilizer Management (Central Valley)

Timing not decided

Program in Spanish on pesticides (Vista/San Marcos) ♦

For more information, visit the UCNFA website:
<http://ucanr.org/sites/UCNFA/>

REGIONAL REPORT - UC Cooperative Extension San Diego County

Biology and control of the myoporum thrips

by James A. Bethke, David S. Shaw, Daphne Li, Marianne Whitehead, and Bryan Vander Mey

The myoporum thrips, *Klambothrips myopori* (Mound and Morris), is a very serious pest of *Myoporum laetum* in CA. It is well known by now as the myoporum thrips, but it really doesn't have an official common name. The damage that it has been causing is quite significant and includes the death of shrub and tree forms of *Myoporum* spp. (fig. 1). There is almost nothing known about the pest, so we have been conducting various pesticide trials, and we have determined the life history at 30°C.

The average length of each life stage at 30°C is the following: egg (13.90 ± 1.2 d), nymphal stages (13.87 ± 0.5 days), first pupa (5.27 ± 0.5), and second pupa (5.00 ± 0.4 days). In summary, the egg stage is about 13 days; nymph to adult is about 24 days. A generation from egg to an egg-producing adult is about 38 days. It was surprising to see the results about the different life stages and the length of time in each stage, but when we compared it to a closely related

species, the Cuban laurel thrips *Gynaikothrips ficorum* (Marchal), they are almost identical.

This thrips is also similar to the Cuban laurel thrips in that they are rather host specific and cause new growth to twist and gall. The galling protects these thrips from insecticide contact and makes them a real challenge to control (fig. 2).

In our trials against the myoporum thrips, products that are showing excellent to good control at the highest recommended rates are the following: Dinotefuran (drench, and trunk applications), Thiamethoxam (foliar and drench applications), Imidacloprid+Bifenthrin (combo product as a foliar), Bifenthrin (foliar) and Imidacloprid+Abamectin (combo product as a foliar).

The single application in our trial was effective for most products for 60 days. At



Fig. 2. The myoporum thrips are protected from contact with insecticides by the galling effects they cause on *Myoporum* spp. leaves.

our 60-day assessment, no thrips were observed in plants treated with a trunk application of Dinotefuran or a drench application of Thiamethoxam.

The systemic products are working surprisingly well as drench applications, probably because of the increased concentrations of the products in the plant compared to the foliar applications. In our research at UC Riverside with Dr. Frank Byrne, the foliar applications have been shown to be not as effective nor are they as persistent as the drench applications. In addition, this insect is difficult to contact with pesticides, so effective applications include protecting new growth or applying systemic products so that the toxicant can reach the feeding stages within the galled tissue.



Fig. 1. The myoporum thrips causes twisting and galling of new growth on shrub and tree forms of *Myoporum laetum*.

James A. Bethke is Farm Advisor, David S. Shaw is Farm Advisor, Marianne Whitehead is Agricultural Technician, Daphne Li is Student Assistant and Bryan Vander Mey is Staff Research Associate, UC Cooperative Extension San Diego County.

Field Observations- UC Cooperative Extension San Diego County

New "A" rated pest in San Diego: European pepper moth

by James A. Bethke

Duponchelia fovealis Zeller, a species of moth without a common name, was detected in a shipment of ornamental plants to Canada back in April of this year, and the trace-back led to a grower in San Diego County. Canada does not consider it to be an actionable pest since it has been found in the area in Canada where it was detected. The United States, however, considers it to be an actionable pest because it is known to be a serious agricultural pest, and it is not known to occur in the United States. This incidence in San Diego was a minor one, and following treatment applications, further surveys of the property could not detect any more moths or larvae.

A second detection occurred in July, and again the trace-back lead to the same area of the county but a different grower. This detection triggered a survey to determine the extent of the invasion, and fortunately or unfortunately, the insect was detected in at least ten counties in California, but not in Imperial County where peppers and other host commodities are grown. Therefore, the invasion was taken seriously and the state entomologist wrote an emergency order. The incidence at the second grower's facility was very extensive and caused a hold of all plants throughout the facility. It took approximately two weeks of intensive treatment applications in order to release portions of the crops for sale and distribution. Older plants were destroyed and younger plants were treated preventatively. In all likelihood, growers of European pepper moth hosts here in the county will have to treat preventatively to remain moth-free and be able to ship.

<http://www.pestalert.org/oprDetail.cfm?oprID=466>

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Duponchelia fovealis damage to *Kalanchoe* stem. Other ornamental host genera include *Anemone*, *Anthurium*, *Begonia*, *Cyclamen*, *Euphorbia*, *Gerbera*, *Kalanchoe*, *Limonium*, and *Rosa*.



J. Bethke

Duponchelia fovealis moth pupa on the underside of a leaf. The pupa is attached to the leaf with webbing, and the larva uses nursery mix to make the cocoon.



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Get timely information on news and other events of interest to the California ornamental horticulture industry

Find links to Facebook pages for nursery and floriculture businesses, organizations and people in the industry

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UCNFA News is published by the University of California Nursery and Floriculture Alliance, a statewide partnership of researchers and educators, growers, floriculture associations and allied industry.

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