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The Increasing Impact of FQPA on Greenhouse Crops: The IR-4 Program to the Rescue

By Michael P. Parrella, Department of Entomology, UC Davis

The 1996 Food Quality Protection Act (FQPA) has posed major legislative hurdles for growers of all crops by establishing new health based standards for crop protection chemicals. In addition, FQPA requires that all of the nearly 10,000 chemical tolerances in effect in 1996 be reassessed over a ten year period. By now, all growers are familiar with FQPA and most are aware of one or more pesticides that have been lost due to this legislation. Like many things in our society, when the legislation was first enacted, there were the dire predictions of doom and gloom where some conjured up images of the loss of all pesticides. Although we have lost some pesticides, has FQPA really been that bad? Taking a devil's advocate approach, there have been losses of pesticides and pesticide registrations, but many of these were minor materials with minor uses and the affected agriculture commodities have survived quite well without them.

Will this continue to be the impact of FQPA, or are more dramatic consequences still to come? Unfortunately, the latter is more likely as we have not even begun to feel the impact of this legislation on the use of pesticides in specialty agriculture such as the floriculture and nursery industry. Most people familiar with FQPA have heard that pesticide use (i.e., labeling) will be controlled through the analogy of a 'risk cup.' Every time a crop and use are added to a pesticide label, this adds to the risk cup. Once the risk cup is full, no more registrations will be permitted. It does not take a market economist to understand that agrochemical companies will fill the risk cup with registrations on the largest and most profitable crops. That will leave specialty crops, such as ornamentals, without many of the chemical tools they have come to rely on over the years. It is even more sobering to realize that even though FQPA was enacted in 1996, the risk cup analogy has yet to come into play regarding pesticide use. That is happening now, and one of the first casualties may be diazinon.

What can a grower, commodity group, or experiment station scientist do about this? There are two courses of action (perhaps three if doing nothing is considered): 1) fight to keep existing pesticide registration on minor crops, and 2) look to supporting the registration and use of alternative pesticides. From a national

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UC Davis Environmental Horticulture Department Establishes IR-4 Center

By Heiner Lieth, Ron Lane, and Linda Dodge

The Department of Environmental Horticulture at UC Davis has taken on the task of working with growers and the USDA Interregional Research Project #4 (IR-4), to develop data needed for registration of crop protection materials that are of interest to growers of specialty crops in the Western United States.

As described in a separate article in this newsletter, IR-4 is the only publicly funded program in the U.S. that conducts research and submits petitions to the Environmental Protection Agency (EPA) for registration of pest control agents on specialty crops. Specialty environmental horticulture crops include all those grown for ornamental purposes; nursery and landscape plants, cut flowers and potted plants.

As you are probably aware, the crop protection industry lacks incentive to pursue registrations on specialty crops for many materials because the low acreage involved means low return on investment. Recognizing this, the state land grant universities and the U.S. Department of Agriculture (USDA) organized the Interregional Research Project #4 in 1963 to address the shortage of pest control options for minor crops. A separate Ornamentals Program was created in 1977 and, since then, over 9000 registrations have been processed for ornamentals. The Biopesticide Program to support research and registration activities on biological pest control agents began in 1982, and 1998 saw the establishment of a Methyl Bromide

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Alternatives Program.

The IR-4 Program has evolved as a bridge to registration by generating and supplying independent, high-quality research data needed by EPA in order to register compounds for use on specialty crops. Collaborations are the strength of the IR-4 program. Input is sought continually from the commodity production side of agriculture as well as from the crop protection industry, USDA, and federal and state regulators.

The Environmental Horticulture Department at UC Davis has made a commitment to develop an IR-4 Center at the Department to focus on ornamental crops and on products that can be useful tools for growers of such crops in California. We have begun to set up experiments for projects that have already been identified jointly by manufacturers, growers, and the IR-4 coordinators as desirable (and thus deemed "researchable"). You can see the current state of what we are doing and planning for the near future at http://envhort.ucdavis.edu/IR4

In the future we hope to be involved in the process of identifying which combinations of materials and plants would represent useful data. Thus, in order to make the program most effective, we need industry input to identify labeling issues whose resolution will provide the greatest benefit to growers. Some examples of projects that would be considered include:

- Registering a material for a particular application where there is currently no effective, registered product.
- Registering a material to provide a different class of chemical to use in a spray rotation.
- Registering a material that provides a shorter reentry interval.
- Registering a material that is currently registered, but does not contain provisions for commonly used application equipment such as ultra-low volume or electrostatic sprayers.

(Note that "material" refers to insecticides, miticides, fungicides, plant growth regulators, insect growth regulators, as well as various biological pest control agents.)

In addition to your input, we also seek assistance to help us obtain plants and related resources for the experiments. The expectation of the IR-4 program is that the manufacturers supply the materials and that growers supply plants. The funding provided to us by the IR-4 program is fairly minimal and earmarked in our budget entirely for salaries. It is also of obvious interest to the industry to have us work with new plants and fresh materials for each experiment. Both growers and manufacturers benefit from this process in having their products included in the trials to generate the highest quality data possible.

Our highest priority is to respond to the needs of the California ornamentals industry. We have identified a set of experiments that we will work on for the next few months. In addition, we need input from you to help us identify experiments that we could begin this summer and fall, or at some time in the future.

If you have suggestions for us or are able to help us in any way, please contact us by mail, email, phone or fax (530-752-1819). For general issues including suggestions for what should be researched, please contact Heiner Lieth (email: jhlieth@ucdavis.edu, phone: 530-752-7198). To get involved by donating plants or be directly involved in experimentation, contact Linda Dodge (email: lldodge@ucdavis.edu phone: 530-752-8419). For suggestions or assistance with materials, please contact Ron Lane (email relane@ucdavis.edu , phone: 530-752-0397). Our mailing address is Environmental Horticulture, One Shields Ave., University of California, Davis, CA 95616-8587. Financial contributions are also welcome and should be made out to Regents of the University of California with a specific notation that it is to be used for our IR-4 projects.

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perspective it is clear that the ornamental industry has been active on both fronts. There has been an unprecedented effort to develop 'pesticide profiles' for specialty crops (often under the guidance of federal and state agencies) in addition to estimating the potential economic impact if important pesticides are lost. Almost all agree that this is important data to collect, but in reality it will probably do little good. These data will most likely be used to measure how growers reduce their use of traditional pesticides over the next few years as they move to alternative materials.

This leads me to my biased view of where the effort should be placed – the support and adoption of new, alternative, 'reduced risk' materials. Such products are generally more selective against target pests, exhibit low mammalian toxicity, and have minimal impact on the environment. These materials are generally more compatible with the notion of integrated pest management (IPM). Programs using these materials are being developed by scientists working in the Agricultural Experiment Station at land grant universities across the US. Although EPA is trying to streamline the process of registering 'reduced risk' pesticides this is still a painfully slow process. Enter an old friend of ornamental crops – the IR-4 program.

The Re-Birth of IR-4

The USDA IR-4 program was initiated in 1963, with the goal of assisting in obtaining pesticide registrations in order to ensure a supply of essential pest management tools for growers of minor crops. The IR-4 ornamentals program began in 1977 to establish tolerances for the green industry, which produces floral, forestry, nursery and turf crops. For the most part, these were for pesticides registered on food crops where there was no economic incentive (on behalf of the agrochemical industry) to obtain registrations on ornamental crops. To say the program has been successful is an understatement. Since its inception in 1977, data has been generated to support more than 8800 pesticide/ornamental crop registrations. Whether they realize it or not, every ornamental grower in the country has benefited because of the IR-4 program.

If this were the only function of the IR-4

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program, I would not be so supportive of this national program. One can only go so far with expansion of existing pesticide labels, recognizing that the EPA will likely eliminate many of these compounds through enforcement of FQPA.

I have been involved with the IR-4 program since I started my career in floricultural entomology in 1980 at UC Riverside. I remember conducting numerous phytotoxicity trials on cut flowers and bedding plants to expand the existing labels of many pesticides. However, I did not fully appreciate the IR-4 program until recently, when I assumed the role of Administrative Advisor of the IR-4 program for the western region (this is an artifact of my Associate Dean position at UC Davis). It is clear that the IR-4 program has emerged as the major way in which new alternative pesticides will get registered for minor crops in the US. The IR-4 program focuses most of its attention on developing registration packages for biopesticides and for reduced risk materials. Seventy percent of all its activity is directed towards labeling for these new 'alternative' products. The IR-4 program has built an impressive relationship with commodity groups, universities, agrochemical companies and regulatory agencies. Fifty percent of all the new pesticide registrations the EPA considered in 2001 were submitted by or with the assistance of the IR-4 program. In addition, they have developed strong relationships with state regulatory agencies (such as the California Department of Pesticide Regulation) which now review reduced risk pesticide registration concurrently with EPA.

The budget for the IR-4 project is a line item in the USDA-CSREES budget. Its budget has been stagnant for many years, and is approximately $9 million annually. The bulk of these funds goes to support four regional research laboratories (Michigan State, Cornell, University of Florida and UC Davis), seven satellite laboratories and 18 Field Research Centers at land grant universities. It has been estimated the IR-4 program, just through its support of Section 18 (emergency use) registrations in 1998, has saved more than 400 million dollars in minor crop losses in the US. Overall, for the period 1998-2000, $1.86 billion in minor crop savings have accrued due to activities of the IR-4 program.

These are impressive figures, especially when considering the relatively small budget of the IR-4 program. Budgets are mysterious things in the federal government and have a tendency to shrink and even disappear. Another item that could be added to the 'What can a grower do?' list is to be sure your representative in Congress recognizes the importance of the IR-4 program to your industry and supports it financially.

The idea that IR-4 supports pesticide registration on minor crops is really a misnomer, since a minor crop is anything less than 300,000 acres (it appears to be anything other than corn, wheat, soybeans and cotton). This comprises almost everything we eat on a daily basis and represents the crops that make food fun to eat. These are also the crops that are threatened by foreign production (imports). By supporting the IR-4 program, Congress can ease the regulatory pressure

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Science to the Grower–Limiting Phosphorus Fertilizer Leaching Losses from Container-Grown Crops

Growers can reduce leaching losses of nutrients by changing the chemistry of the container media they use. Common practices include using a sparingly soluble fertilizer, increasing adsorption to soil particles (e.g., increasing cation exchange capacity and switching from anionic to cationic nutrient sources), using fertilizers that decompose slowly, and using controlled-release fertilizers.

In the last issue, we discussed one way to decrease nitrogen leaching. Phosphorus (P) is another nutrient that can be a significant water pollutant if it leaches from the root zone. Potting media are especially prone to phosphorus leaching. Mineral soils bind phosphorus in a sparingly soluble form over a wide pH range, but container media bind it weakly under normal growing conditions. As much as 75% of phosphorus fertilizer is leached during container plant production.

One way to improve retention of phosphorus involves addition of a zeolite mineral, clinoptilolite (Williams and Nelson 1997; Pickering and others). Zeolites are best known for retaining positively-charged nutrients, but they can adsorb some phosphorus. Williams and Nelson soaked zeolite in a concentrated phosphorus solution, added it (20% by volume) to a peat-perlite mix, and grew a crop of pot mums. The use of zeolite reduced the leaching loss of phosphorus to about 27% of the amount lost from pots that received normal fertilizer applications, but the plants were smaller. Zeolite was an adequate source of phosphorus during the first month, but released too little during later stages of production. Pickering also found that phosphorus release from zeolite was insufficient for a fast-growing potted crop, but perhaps adequate for plants that have a low Phosphorus requirement.

Promising results were obtained with alumina and calcined clays charged with phosphorus (Williams and Nelson 2000; Williams and others). Pot mums grown in a peat-perlite mix containing 30% alumina were the same size as plants that were fertilized normally, and only 0.1% of the applied phosphorus was lost to leaching. These are exciting results, but the high cost and weight of alumina may limit commercial use.

Two calcined (baked) clay products, Fuller's Earth and Turface, also worked well as a phosphorus source. Pot mums grown in a peat-perlite mix containing 20% Phosphorus-charged calcined clay were the same size as controls, and phosphorus leaching was reduced by about two-thirds. Most of that loss occurred during the first weeks, when phosphorus release was high and plant uptake was low. Use of phosphorus-charged calcined clays could be a commercially feasible way for growers to increase the efficiency of phosphorus fertilization. *Note: Reference list by request to the author at ryevans@ucdavis.edu.* ❖

By Richard Y. Evans, Department of Environmental Horticulture, UC Davis

Regional Report

San Mateo & San Francisco Counties

Humidity Control in the Greenhouse as an IPM Tool

In the spring and autumn, greenhouse temperatures tend to fluctuate more, with warmer daytime temperatures and cooler night temperatures. As a result, humidity and condensation can increase in the greenhouse from increased transpiration and evaporation. Cooler nights mean more condensation on greenhouse surfaces and on plants themselves. High amounts of condensation on greenhouse coverings can even reduce light levels in the greenhouse in the mornings. In foggy, coastal areas where light levels may already be low, this can be cause for concern.

While plant growth is usually good under higher humidity conditions (depending on the species, of course), high humidity promotes increased chances for foliar diseases, such as botrytis and powdery mildew. Increased levels of disease can be found throughout the greenhouse, due to higher humidity levels in general, but particularly in areas where condensation causes dripping onto plants (from overhead greenhouse structures).

It is becoming more apparent that humidity levels and condensation in the greenhouse can also have an impact on populations of insects and mites (both pests and beneficials). Fungus gnats, for example, thrive in moist areas where algae are present (fungus gnats feed on the algae). By reducing condensation and freestanding water in the greenhouse (on benches, floors, and other areas), algae populations can be reduced, followed by reductions in fungus gnat populations. Simple control of moisture levels can have a profound impact on fungus gnat populations. Mites (beneficial and pest species) are also affected by humidity levels. By incorporating humidity control as an IPM tool, you can have an impact on insects, mites, and diseases.

Condensation on greenhouse coverings can be reduced by initial choice of materials, and in some cases by spraying it with wetting agents, which encourages the moisture to coalesce and run down the covering surface. Condensation and excess dripping is not usually a problem in traditional glasshouses, but single-layer polyethylene houses are notorious for condensation dripping. Adding a second layer of polyethylene (double poly houses) significantly reduces condensation. Newer greenhouse coverings may be treated with materials that reduce condensation and dripping — depending on your situation, these materials may well be worth using. It is important to make sure that they are installed properly, with the treated side placed to the inside (or as directed by the manufacturer).

Ventilation is one method to reduce humidity. By moving the warm, moist air out of the greenhouse, and replacing it with cooler, dryer air from outside, the humidity levels decrease. It will usually be necessary to run heaters then, to bring the cooler temperatures up to the desired temperatures. This heating of air reduces the ambient humidity level. According to John Bartok at the University of Connecticut, if houses have fans, turn on the fans for a few minutes before venting and then heating the greenhouses. This should be done two or three times per hour after the sun goes down and early in the morning at sunrise[1].

Continuous movement of air in the greenhouse markedly helps humidity control and can reduce foliar fungal disease pressures. Dense canopies of foliage can be 20-40 percent higher in humidity than the air above the canopies. By moving air through the canopy, humidity levels are lowered in the plant canopy, and leaf temperatures can be kept higher. This air movement often prevents condensation from occurring on the leaves, and reduces spore germination. Air movement can best be achieved with simple, inexpensive horizontal airflow fans (HAF), or other blowers in the greenhouse (such as perforated poly tubes which run the length of the greenhouse).

It is also important to reduce wet surfaces in the greenhouse, especially before sunset. Keep the greenhouse floors and benches dry, as much as possible — use drip irrigation, or other efficient forms of irrigation. Irrigate early in the day, when possible, to allow bench and floor surfaces to dry during the day. Avoid over watering in any form, so that there is less excess moisture in the greenhouse to evaporate and raise humidity levels.

There is not adequate space in this column to address the fine details of humidity regulation. Standard greenhouse textbooks usually have good information on factors that affect humidity. Some of the trade journals also have good articles on humidity control and its impact on pest management. I suggest that you consult your standard textbooks, or look at some of the recent articles listed below. I will send copies to you if you do not keep back copies of these journals.

References:

1. *Reduce greenhouse humidity*; by John Bartok. GM Pro, Feb. 1999, pp 56-57.

2. *Greenhouse condensation*; by J. Raymond Kessler, Jr. Greenhouse Product News, Sept. 2002, pp 96-97.

3. *It's cold out! So why ventilate?*; by A.J. Both. GrowerTalks, Dec. 2000, pp 82-84.

4. *Humidity: blessing or burden?*; by Lynn P. Griffith. GrowerTalks, June 2001, pp 110-112.

5. *Condensation control*; by Peter Ling and Jesssica Prenger. GrowerTalks, Jan. 2002, pg 90.

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Regional Report

Santa Cruz & Monterey Counties

Phytophthora ramorum in European Nurseries

In California and Oregon, *Phytophthora ramorum,* the organism that causes Sudden Oak Death, is primarily a disease of woodland and urban-woodland interface. It can infect a broad range of native trees and shrubs (and one herbaceous species), currently numbering about 20 species. In addition, rhododendrons have been confirmed as hosts in nursery stock, but presently only one nursery in California was found infested. Recently, a common ornamental, *Pittosporum undulatum* (Victorian box) was found as a host on the U.C. Berkeley campus.

The opposite situations exist in Europe. No infected oaks or other native species have been found there. So far, the disease is limited to nurseries and gardens, and only on *Rhododendron spp., Viburnum x bodnantense* 'Dawn', *Viburnum tinus* in the UK, and *Pieris,* also in the UK. *Phytopthora ramorum* causes leaf and twig blight on rhododendrons and basal stem death in viburnums.

Molecular studies of isolates from Europe indicate that the *Phytophthora ramorum* strain found in European countries is a different mating type from the isolates in California. These findings indicate that the pathogen probably did not move directly from California to Europe or vice-versa.

So far, *P. ramorum* has been found in the Netherlands, Germany, the UK, France, Poland, Italy, Spain, Belgium, and Sweden. Some examples of frequencies are:

Netherlands–18 samples of infected rhododendron and 1 infected *Viburnum x bodnantense* 'Dawn' were found between 1993 and 2000 at 16 gardens or nurseries. A survey carried out in 2001 found infestations in 11 of 78 nurseries and garden centers, and 7 of 136 public or private gardens. Especially susceptible Rhododendron species are *R. ponticum* and *R. x catawbiensis.*

UK –After no findings of *P. ramorum* in the UK until April 2002, there were 131 sites found in 2002, including the only reported infection of *Pieris*.

France –April 2002 also marked the first finding in France. About 30 nurseries were found to be infected, mostly on rhododendrons.

Spain–Recently two shipments of rhododendrons from the island of Mallorca were found to be infected.

The European Union has taken action in the form of inspection and quarantine regulations. Susceptible plant species can be moved only if they are accompanied by a plant passport certifying that they come from an area known not to be infested with a non-European (US) isolate, and if they have been free of symptoms since the beginning of the last full growing cycle. If *P. ramorum* is found, then all susceptible plants within 2 meters are destroyed, and all susceptible plants within 10 meters and any additional plants in the lot are held for a period of 3 months, with at least 2 additional inspections before being released. The rest of the facility is intensively reinspected before allowing plants to be moved.

In addition, the UK Department for Environment, Food & Rural Affairs (DEFRA) lists a number of precautions to be taken by inspectors, including sanitary procedures to avoid spreading the disease between nurseries. This information is available at http://www.defra.gov.uk/planth/what.htm

Karl Buermeyer, Sudden Oak Death Coordinator, was primarily responsible for the research and writing of this article. He is available at 831 763-8012. Email: krbuermeyer@ucdavis.edu.

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Field Observations

First Report of a Leaf Spot Disease of Bells-of-Ireland (*Moluccella laevis*) in California Caused by *Cercospora apii*

Bells-of-Ireland (*Moluccella laevis*) is an important annual plant that is field planted in coastal California for commercial cut flower production. In 2001, a new leaf spot disease was first found in these commercially grown cut flowers. The disease was most serious in the winter-grown crops in 2001 and 2002, with a few plantings having up to 100% disease incidence. All other plantings that were surveyed during this time had at least 50 % disease incidence. Initial symptoms consisted of gray green leaf spots. Spots were generally oval in shape, often delimited by the major leaf veins, and later turned tan. Lesions were apparent on both the bottom and top sides of the leaves. Steve Koike, UCCE plant pathologist in Salinas, confirmed the identification and pathogenicity on the host. This is the first report of *Cercospora apii* as a pathogen of bells-of-Ireland in California.

Cercospora apii is the same pathogen that causes a leafspot on celery. In celery, *Cercospora apii* is a seedborne pathogen and may also survive in the field on celery debris. Spores are spread via wind and splashing water. Cercospora-indexed seed and careful inspection of transplants for the disease is recommended. In celery, chemical control is usually not necessary. Other diseases in vegetables and ornamentals caused by other *Cercospora* species are controlled with thiophanate methyl (Clearys 3666), clorothalonil (Daconil), mancozeb (Dithane), and copper hydroxide (Champ).

Regional Report

Ventura & Santa Barbara Counties

Clean Water Program Update

The Clean Water Program in the South Central Coast Area is a relatively new program developing in response to emerging regulatory issues. In Santa Barbara County, the Regional Water Quality Control Board has mandated "0 runoff" from greenhouses, which is being enforced through on-site inspections. These inspections are limited to Carpinteria, but are likely to increase throughout the jurisdiction of this Regional Board, which extends all the way north to the Salinas Valley. In addition, the County of Santa Barbara has approved a greenhouse program that will increase county regulations regarding runoff.

In Ventura County, on the other hand, the Clean Water Program is developing primarily in response to the TMDL process. The Calleguas and Santa Clara watersheds, in particular, have nutrient EPA-TMDL adoption dates scheduled within the next couple of years that will affect agriculture. In response, an Agricultural Oversight Committee was recently formed to act as an advisory group to the governing Regional Water Quality Control Board (Los Angeles) and other stakeholder organizations regarding impacts of agricultural activities to surface and groundwater. The committee is made of growers representing major commodity groups, including floriculture and nursery crops. Committee members also include representatives from regulatory agencies and from UC Cooperative Extension, Ventura County.

In addition to the TMDL process, there are other regulations, which will likely affect growers. These include ground water pest management zones proposed for Ventura County by the Department of Pesticide Regulation, slated to affect the use of certain pesticides. There are also existing storm water regulations, which may be increasingly enforced in agricultural operations.

Hansen Trust Grant Activities. Last year, through a Ventura County Hansen Trust grant, our office was able to provide irrigation training and on-site educational opportunities for ornamental growers. These raised the level of grower consciousness about the seriousness of the runoff issue and the related regulations. In addition, we initiated the process of collecting baseline data concerning water management by the industry on a collective basis. This study showed that many growers could improve their irrigation management by simply improving irrigation efficiency and distribution.

Currently, The Hansen Trust has funded another year to continue to help Ventura County ornamental growers determine and implement the best strategies for minimizing runoff in their operations. It includes a research study with Don Merhaut, Laosheng Wu, and Jay Gan (UC Riverside), Richard Evans (UC Davis) and Ben Faber (UCCE, Ventura County). This study will evaluate BMPs and improved technologies for managing runoff at three nursery sites, where we are monitoring nursery runoff quantity and quality. We will continue to monitor after improved practices and technologies are implemented to determine the efficiency and cost-effectiveness.

Other ongoing Hansen Trust projects include examination of nitrogen and water uptake and nitrogen release rates in woody plant crops (with Richard Evans and Don Merhaut) and the effects of coir and peat media and fertilization methods on nitrate leaching and flower quality in lilies (with Don Merhaut).

KKRF/CORF Educational Meetings. I have also obtained support from KKRF/CORF for three educational meetings in 2003 in Ventura and Santa Barbara Counties. This will include a meeting in Spanish for Hispanic irrigators and nursery workers.

Proposition 13 to Fund One Million Dollars to Growers. I have recently received approval for over 2.5 million dollars in Proposition 13 funding over the next 3 years, along with Evans, Faber, Gan, Merhaut and Wu. This project will provide one million dollars for the implementation of improved technologies and BMPs to ornamental producers who are willing to cost-share and meet specific criteria. It will also assist in the development of BMPs for specific ornamental crops, and educational materials that can be used statewide**.** This grant will greatly expand the size and scope of the Clean Water program, which will include evaluation of pesticide residues in runoff. However, the funds for grower improvements are limited to ornamental growers in Ventura and Los Angeles Counties. If you are interested in applying for these funds, contact Christie Vergely, UCCE, Ventura County Water Coordinator: 805/645-1463 (phone), cerea@ucdavis.edu (email).

There are other grant funds that are available to help growers in Santa Barbara County implement improvements in their nurseries for better managing irrigation/fertilizer and complying with increasing government regulations. The Environmental Quality Incentives Program (EQIP) is a voluntary conservation program that promotes agricultural production and environmental quality. Through EQIP, growers may receive up to 75 percent of improvements, up to $450,000 per individual over the period of the 2002 Farm Bill.

EQIP applications are accepted by the Natural Resource Conservation District (NRCS) all year, but for the current round of funding for Santa Barbara County, there was a Feb. 3 filing deadline. Contact the Santa Maria NRCS office for further information. (phone: 805/928-9269, ext. 105 or 108; Internet: http://www.nrcs.usda.gov/programs/farmbill/2002/products.html)

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Regional Report

San Diego County

Sabbatical Leave Plans in Australia

Academics in the University of California have the opportunity to take periodic sabbatical leaves of absence to work on special projects or increase their skills. This will be the first sabbatical leave of my career. My sabbatical will occur January 15, 2003 to January 14, 2004.

Goals:

1. Increase knowledge of native Australian plants and their potential for use in the commercial ornamental production industry.
2. Increase knowledge of the pest complexes associated with native Australian plants.
3. Study Australian native predaceous mites reportedly effective in controlling our native western flower thrips to ascertain efficacy and feasibility for importation into California.

Background and Description of Project

Crop diversification is the main reason ornamental crop growers in San Diego County have remained economically viable in the face of increasing foreign imports. Instead of growing roses or carnations, San Diego County growers are now growing more than 1,000 different types of cut flowers. A large percentage of these cut flowers and cut greens are Australian native plants, eucalyptus, waxflower, rice flower, boronia, to name a few.

However, there is very little information available about: 1) appropriate cultural practices for all of these plants, 2) the pests which attack these native Australian plants, or 3) appropriate pest management strategies for these pests.

The lack of knowledge of pests attacking native wildflowers has been detrimental to efforts to introduce new plants and crops into the ornamental market in California. Surprisingly, Australia has lacked the resources to devote an entomologist to study the pests of many of their ornamental crops. This lack of knowledge impedes the import of these materials into our country; because the pest complexes of the Australian native wildflowers are not well-known or understood, plant material is often delayed in quarantine, making importation into the U.S. difficult.

The production cycles for Australian-grown and California-grown waxflower and other native plants are complementary. Florist associations, such as FTD, will not put flowers in their design catalogs unless they are available (almost) year round. Thus, it is a marketing advantage to California growers to have these products shipped in from Australia.

I plan to visit Australia to study the native habitat and pest complexes where the commercial 'native wildflowers' originated, as well as visit commercial production facilities to study the cultural practices and pest management programs in place. I will use the Institute for Horticulture Development as a base for my work. I will also be traveling to various areas around Australia and New Zealand, including Perth, Sydney, Port Macquarie, Adelaide, and Brisbane.

Western flower thrips is a major pest of ornamental crops in California. This insect is endemic to the western U.S. and is referred to as the 'California Thrips' in other parts of the world. We have no effective biological control agent for this pest in the U.S. This lack of an effective natural enemy for this pest has compromised numerous biological control programs in ornamental crops throughout the state. A new predatory mite has been identified in Australia, which shows promise for controlling western flower thrips. However, some biological studies will need to be conducted before regulatory agencies will allow its importation into this country.

I have contacted entomologists and horticulturists in Australia about my interest in conducting biological research on the Australian mite as well as evaluating the pest/natural enemy complexes present on native ornamental crops. There was great interest in my proposals, and a willingness to provide lab space and making insect collections available to me during a sabbatical leave.

I expect these sabbatical leave projects to increase my effectiveness as a floriculture and nursery crops farm advisor by increasing my overall knowledge of an important group of new crops to the California industry and providing an opportunity for in-depth study of a potential new biological control agent for a serious pest of many California crops, the western flower thrips. This project also has impacts on the San Diego County Flower and Nursery Crops industry if it becomes easier to import Australian native products as a result of this research. There is tremendous potential impact on the California Flower and Nursery Crop industry if the predatory mite is effective against western flower thrips and can be imported into the state.

Specialists and farm advisors in San Diego County and in neighboring counties have agreed to answer calls and provide some assistance to clientele in my absence. If you need information, please call the front desk of my office at 858-694-2845 and you will be referred to someone who can answer your questions.

IPM and Clean Water Programs will continue during my absence with the assistance of my program representative, Diane DeJong and other staff.

Further updates on my sabbatical project will be in subsequent issues of ***CORF News***.

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Get Cultured: What is pH–Part III?

By Dr. Donald Merhaut, Extension Specialist, Nursery and Floriculture, UC Riverside

This is Part III of a five-article series on soil/water pH, which started in the summer issue of Corf News, 2002.

Fertilizers may have a major impact on the pH of the media by either increasing or decreasing the soil solution pH. These effects are caused by two mechanisms: 1. **Chemical effects**–caused by the fertilizer coming in contact with the soil or media. 2. **Biological effects**–caused by the reactions that occur when either the plant roots or soil microorganisms take up the nutrients.

Chemical Effects

Acid-Forming Fertilizers and Amendments

The following fertilizers will react with soil water or oxygen to form free hydrogen ions (H^+). The term 'free' is a chemistry term that indicates that an ion, in this case H^+, is not chemically attached to other compounds or soil material. The H^+ ions are in the soil solution, resulting in a lower pH of the soil solution.

• Ammonium (NH_4^+)-based fertilizers. These fertilizers include products such as urea, anhydrous ammonia, and cottonseed meal. The ammonium (NH_4^+) reacts with oxygen (O) to form H^+ ions.

Equation 1: $NH_4^+ + 2O_2 \rightarrow 2H^+ + NO_3^- + H_2O$

•Ferrous Sulfate ($FeSO_4$). The iron (Fe) reacts with water (H_2O) to form H^+ ions.

Equation 2: $Fe^{2+} + 2H_2O \rightarrow Fe(OH)_2 + 2H^+$

• Elemental Sulfur (S). The sulfur reacts with oxygen (O) and water (H_2O) to form sulfuric acid (H_2SO_4). This compound dissociates (the elements chemically separate from each other) to form H^+ ions.

Equation 3: $2\ S + 3\ O_2 + 2\ H_2O \rightarrow 2\ H_2SO_4 \rightarrow 2H^+ + 2SO_4^{-2}$

• Aluminum (Al)-based fertilizers. Aluminum (Al) reacts with water (H_2O) to form H^+ ions (Equation 4).

Equation 4: $Al^{3+} + 2H_2O \rightarrow Al(OH)_2^+ + 2H^+$

• Organic matter. Organic matter that is low in base-forming compounds [calcium (Ca), magnesium (Mg), potassium (K) and sodium (Na)], will break down to form free H^+. These organic media include acidic-type peat mosses, pine needles, some sawdusts and leaf molds. The biological and chemical breakdown of organic matter results in an increase in inorganic and organic acids, which can dissociate to form H^+.

Equation 5: Organic matter → carbonic acids (H_2CO_3), sulfuric acid (H_2SO_4), nitric acid (HNO_3)

$H_2CO_3 \rightarrow 2H^+ + CO_3$ $\quad$ $H_2SO_4 \rightarrow 2H^+ + SO_4$ $\quad$ $HNO_3 \rightarrow H^+ + NO_3$

Base-Forming Fertilizers

• Oxides–such as calcium oxide (CaO) and magnesium oxide (MgO).

• Hydroxides–such as calcium hydroxide [$(Ca(OH)_2$] and magnesium oxide [$Mg(OH)_2$]

Equation 6: $2H^+$[soil particle] + $Ca(OH)_2 \rightarrow Ca^{2+}$[soil particle] + $2\ H_2O$

• Carbonates–such as calcium carbonate ($CaCO_3$) and magnesium carbonate ($MgCO_3$).

All of these compounds react with the soil particles, exchanging the hydrogen ions (H^+) off of the soil colloids and replacing them with either calcium or magnesium. The free H^+ then reacts with the OH^- to form water.

Equation 7: $2H^+$[soil particle] + $Ca(HCO_3)_2 \rightarrow Ca^{2+}$[soil particle] + $2\ H_2O + 2\ CO_2$

Equation 8: $2H^+$[soil particle] + $CaCO_3 \rightarrow Ca^{2+}$[soil particle] + $H_2O + CO_2$

For a guide to fertilizers and their pH altering effects, please refer to the Western Fertilizer Handbook (California Plant Health Association, 2002) (Interstate Publishers, 1-800-843-4774, Fax: 217-446-9706, email: info-ipp@ippinc.com)

Biological Effects

Biological effects on rhizosphere pH occur as a result of ions excreted from plant roots in response to the type of nutrients taken up into the roots. Other important reactions involved the biological conversions of nutrients from one form to another through microbial activity.

Acid-forming Reactions.

• Excess cation uptake - If an excess of cations (positive ions) are taken up into the plant, relative to the uptake of anions (negative ions), positive ions may be released in the form of hydrogen ions (H^+), which results in decreased rhizosphere pH. Nutrients that are taken up in the form of cations include calcium (Ca^{+2}), ammonium (NH_4^+), potassium (K^+), magnesium (Mg^{2+}), iron (Fe^{2+}), manganese (Mn^{2+}), copper (Cu^{2+}), zinc (Zn^{2+}). Nutrients taken up in the form of anions include sulfates (SO_4^{-2}), phosphates (H_2PO4^-), nitrate (NO_3^-), molybdate (MoO_4^-).

• Nitrification of ammonium (NH_4^+) – Through microbial action (specific soil bacteria), ammonium (NH_4^+) can be converted to nitrate (NO_3^-). This process produces H^+ ions.

Equation 9: $2\ NH_4^+ + 4O_2 \rightarrow 2NO_3^- + 4H^+ + 2H_2O$.

• Oxidation of sulfur (S) – Through microbial action, sulfur (S) in the form of H_2S, reacts with oxygen to form sulfuric acid (H_2SO_4), which dissociates to form H^+.

Equation 10: $2H_2S + 4O_2 \rightarrow 2H_2SO_4 \rightarrow 2H^+ + SO_4^{-2}$

Get Cultured

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Base-forming Reactions.

If anion uptake is higher relative to cation uptake, the result may be the release of hydroxyl ions (OH^-) from plant roots, resulting in an increase in rhizosphere pH. Since nitrogen accounts for approximately 70% of the total ions taken up, the form of nitrogen can have the most influence on this process. When nitrate (NO_3^-) is the predominant N form, OH^- will be released resulting in an increase in pH (Figure 1). The rhizosphere pH will decrease when ammonium NH_4^+ is the predominant N form (Figure 1). When N is present as both NO_3^- and NH_4^+, the solution pH is relatively stable.

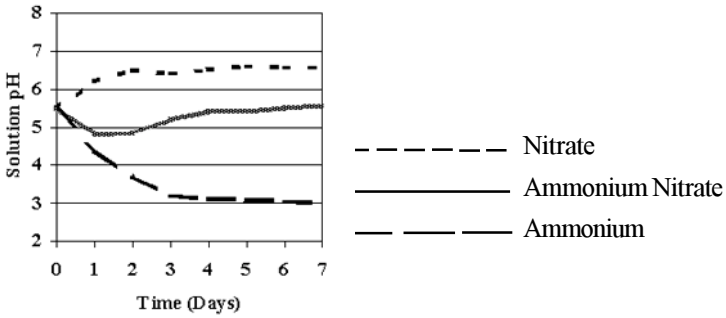

Figure 1. Effects of nitrogen form: nitrate (NO_3^-), ammonium (NH_4^+), and ammonium nitrate (NH_4NO_3) on solution pH for sorghum plants grown in solution culture (Clark, R.B. 1982. Journal of Plant Nutrition. 5: 1039-1057). Similar, but usually less extreme effects will occur for other plants grown in different types of planting media. Plants grown hydroponically (i.e. rock wools, recirculating solutions), which do not have large buffering capacities to pH changes, are more susceptible drastic pH fluctuations.

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FQPA Impact

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growers are feeling and take a small step toward keeping agricultural production competitive in the US.

Although it is not a certainty, the budget for IR-4 appears to be headed for an increase for 2002-2003. Even before this increase, the IR-4 program was considering getting more serious about ornamentals by appropriating money for ornamentals and by creating four regional centers. Last year was the first year that IR-4 gave money to support ornamentals research ($25,000 per region) – but this amount is hardly worth mentioning. That does not mean that IR-4 did not support ornamentals research in the past – this was done at the discretion of the program coordinator – no money was sent to the western region from national headquarters specifically to support ornamentals. That may change in the coming year with the formation of these centers, including the recently formed center at UC Davis. (See accompanying article.)

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How to Use That New Pesticide, *Legally*…

By Karen L. Robb and Ann I. King

Ornamental plant growers in California often feel that they are at a disadvantage in the number of available pesticide registrations. The IR-4 program is a federal program to expand the registration of existing labels to include minor or specialty uses. The IR-4 Program is discussed in this edition of ***CORF News***. However, when pest problems arise that cannot be controlled with currently registered pesticides, an emergency registration exemption (Section 18) or special local needs (SLN) registration may be obtained from the California Department of Pesticide Regulation (CDPR).

Emergency Use Authorizations (Section 18s) are allowed under Section 18 of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and must be granted to CDPR by the U.S. Environmental Protection Agency (US EPA). These exemptions are reserved for emergency situations, such as a newly introduced pest for which there is no registered pesticide. If an emergency exemption is allowed by US EPA, CDPR then issues an authorization for use of a nonregistered pesticide. This authorization functions as a supplemental label and must be in the possession of the user at the time of application. The pesticide application must be conducted in compliance with the restrictions of the emergency authorization. Any pesticide used under a Section 18 authorization is considered a Restricted Use Material; a permit is required from the local Agricultural Commissioner prior to possession or use of the material.

Special Local Needs registrations are used when a pesticide is registered for use in the U.S., but not on the crop or commodity where a particular need exists. If any other pesticide is registered for the pest/commodity combination in question, however, it is unlikely a SLN registration will be granted (insecticide resistance management strategies notwithstanding!) An SLN may be requested by the registrant of the pesticide, an individual, an organization, or a governmental agency.

A SLN cannot be issued if: 1) there are adequate products already registered and available to meet the need, 2) the use has

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Campus News & Research Updates

Submitted by Julie Newman, UCCE Farm Advisor, Ventura and Santa Barbara Cos.

Campus News & Research Updates

UC DAVIS

Loren Oki began work last fall as the new UCCE Assistant Specialist for Landscape Horticulture. He has a split appointment of 80% in the Environmental Horticulture Department and 20% in the Landscape Architecture Program.

Loren has been involved in the California green industry since 1978. His grandfather, Magoichi Oki, emigrated from Japan and founded Oki Nursery in Sacramento in 1907. This family business thrived for 86 years, and comprised nearly 300 acres of growing grounds and one million square feet of greenhouse space. The range of plants produced changed over the years from fruit trees and bedding plants to wholesale ornamentals and seasonal greenhouse container plants.

Loren obtained his Bachelor of Science Degree in Ornamental Horticulture at Cal Poly, San Luis Obispo and his Master's Degree at UC Riverside, studying under the legendary Toshio Murashige. He began work at Oki Nursery in 1978 as manager of the tissue culture laboratory, and he soon worked his way up to greenhouse production manager. When his father retired in 1988, Loren and his brother, George Samuel, ran the nursery business. Loren served as president of the company for five years.

During his nursery career, Loren participated extensively in trade groups and community organizations and his dedication to these groups continues to the present. He has been especially active in the California Association of Nurserymen (C.A.N.) and was named Young Nurseryman of the Year in 1986. He has also been very active in the International Plant Propagators' Society (IPPS).

In 1994, Loren began working on a Ph.D. at UC Davis with Dr. Heiner Lieth in the Environmental Horticulture Department. Research for his dissertation, "Effects of Substrate Salinity on Rose Stem Elongation," led to the development of a device for continuous measurement of substrate moisture electrical conductivity.

In his new position as landscape horticulture specialist, Loren has already identified several areas of focus for his research and extension programs. The issue of pesticide and fertilizer runoff contaminating urban streams and watersheds is of prime importance to Loren, and is a problem he dealt with as president of Oki Nursery. He has proposed a research study to characterize runoff in numerous urban areas in California. Loren also plans to contribute to the growing body of knowledge concerning selection, evaluation, propagation and production of native plants.

Richard Evans, UCCE Specialist in the Department of Environmental Horticulture**,** received a grant award of $131,052 from CDFA-FREP for "Determination of nursery crops yields, nutrient content, and water use for improvement of water and fertilizer use efficiency." He also received a grant of $101,948, with **Wes Hackett** and **Ken Gile**s, from UC-DANR for "Improvement of methods for vegetative propagation of California native plants."

UC RIVERSIDE

The Department of Nematology is cosponsoring the 35th California Nematology Workshop, along with CDFA and PAPA. The workshop will be held Wednesday, March 4, 2003, from 8 AM–4:30 PM at the Quality Resort, San Diego (875 Hotel Circle South).

This workshop offers pest management professionals and growers the latest information on problems caused by plant-parasitic nematodes and their potential solutions. This year's main topic will be invasive nematode pests. Target audiences for this program include pest control advisors and operators, growers, pesticide and bio-control industry representatives, retail and nursery employees, arborists, landscapers, municipal and state employees, parks and recreation personnel, educators and consultants. A superb lineup of speakers and workshop presenters will share their expertise concerning nematode-related issues. Posters will provide the latest nematology research activities at the University of California, CDFA, and USDA, as well as in the industry. Breakout sessions will give the audience an opportunity to sharpen skills in nematode identification, disease diagnostics, sampling procedures, and surfing the Internet for information on plant parasitic nematodes. Registration Fees: $55 per person for early registration, no later than 10 days prior to meeting. $65 for late registration per person. Registration contact: PAPA, P.O. Box 80095, Salinas, CA 93912-0095, Phone: 831-442-3536. ❖

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Thanks to these Sustaining Sponsors of CORF Educational Programs

CCFC Research Projects Continue to Aid Growers

By Janice Wills, Program Coordinator, CORF, CCFC, KKRF

Part of the enabling legislation of the California Cut Flower Commission ,CCFC, includes a mandate to provide research and education to the flower growing community. Since the inception of the Research and Education Committee, the CCFC has funded over $660,000 in research directly relating to the floriculture industry.

Recently, the CCFC Research and Education Committee turned much of its efforts towards finding viable alternatives to Methyl Bromide. We have generated grant monies from US EPA, USDA, and various alternative suppliers to put on trials. The trials are ongoing and we are grateful to the growers who have allowed our research teams to put on these trials in their fields.

The committee has been working to get new crop protection materials registered for use in California. Work toward getting Pro-Gibb registered has been ongoing. We are pleased to announce that the registration packet for Pro-Gibb is at the California Department of Pesticide Registration and an answer is expected in the next couple of months.

Please contact CCFC at 831-728-7333 or email jwills@ccfc.org if you have a specific research project that you would like to see pursued. ❖

Use Pesticide Legally

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been canceled, suspended, or denied by the EPA; or 3) the pesticide will be used on a food or feed crop for which a residue tolerance has not been established.

Neither a Section 18 exemption nor a SLN registration will be granted unless the registrant supports the use.

Application forms for Section 18 emergency exemptions and SLN registrations are available on the web at www.cdpr.ca.gov/docs/registration/regmenu.htm ❖

CORF
Floriculture education from the Kee Kitayama Research Foundation

CORF News is the quarterly publication of CORF, the California Ornamental Research Federation, a statewide partnership of growers, floriculture associations, allied industry and researchers/educators whose mission is to identify and meet the research and educational needs of the California floriculture industry.

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Calendar of Industry Events

February
23–25 . SAF Pest Management Conference, Orlando, FL, 703/836-8700

March
2–4 ..... CCFC Trade Mission, Dallas, TX, 831/728-7333
4 ..... 35th California Nematology Workshop, San Diego, 831/442-3536
17–18 . SAF Congressional Action Days, 703/836-8700

April
2–5 ..... ICFG 2003 Spring Meeting, Vancouver, BC, 517/655-3726
2–5 ..... WF&FSA Annual Convention, San Antonio, TX, 410/573-0400