



CORF News

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Recent Trends in California Floriculture and Nursery Production

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

Ornamental horticulture production in California has undergone tremendous changes over the past 20 years. Cut flower growers have experienced intense competition from growers in Colombia and Ecuador, while nursery crop producers have benefited from the strong domestic economy and surging demand for landscape plants. All growers are aware of these basic facts, but this is a good time to take stock of recent production and marketing trends and consider how they may affect California growers during the next several years.

Cut flower growers face strong competition from imports. Of all ornamental crops, only cut flowers have declined in domestic production nationally. Sales of

imported flowers has exceeded those of domestic cut flower producers since 1995, and imports now account for 60% of U.S. cut flower consumption. Producers of roses, carnations, and chrysanthemums have been hit particularly hard (see Figure 1, page 3). The number of cut roses sold by California growers decreased 50% between 1997 and 2001. Carnation production in 2001 was only one-sixth of what it was in 1993.

There have been several consequences. Nationally, there has been a decline in the number of floriculture crop producers. Small

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Courting Generation X

By Kathryn Miele, Director of Marketing, California Cut Flower Commission

Generation X—young adults ranging in age from 19 years old to late-thirties—could present a profitable marketing niche for the floral industry. By 2005, this age group will comprise an estimated 80 million people in the United States. Because many are remaining single and living at home longer than earlier generations, they also have considerable discretionary income.

Winning sales from these young adults requires a strategy tailored to their buying habits. Marketing executive Karen Ritchie points out in her book, *Marketing to Generation X*, that the preferences of these consumers have been shaped by different historic events and cultural trends than those of Baby Boomers. For example, many experienced lean economic times in their youth and, as a result, are less idealistic.

Floral retailers have observed distinctive trends in flower purchasing among these young adults. Many are very cost con-

scious and more pragmatic than earlier generations. Martha Stewart, with her emphasis on simple designs and unusual flowers, has also been a very strong influence.

Seattle designer and CCFC Outreach & Education team member, Kim Morrill, AIFD, says that Gen Xers gravitate to unusual flowers, such as cymbidium and phalaenopsis orchids. Novel items such as craspedia and protea appeal to their sense of drama. The rose 'Hocus Pocus,' with chartreuse splashes on dark red petals, exemplifies the exotic beauty that appeals to these consumers.

Gen Xers also tend to like round flowers. The gerbera daisy, with its retro face and bright, warm colors, is a particular favorite. Flowers that make a dramatic, colorful statement, such as roses, dahlias, French tulips and callas,

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Growers Express Views on Changing Industry Markets

By Steve A. Tjosvold, Ann I. King, and Julie P. Newman, UCCE

Growers throughout California were asked, "How do you see the ornamental market changing?" and "Do you plan to change your marketing strategy as a result of these changes?" The following are some of their answers.

Suncrest Nurseries Inc. is a wholesale nursery of 50 acres in Watsonville, California. They are devoted to broadening the gardening experience with a wide variety of plants suitable for outdoor culture in coastal and near-coastal California. Major categories include unusual showy trees; evergreen and deciduous flowering shrubs;

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floriculture businesses (sales under \$100,000) have been affected most. The number of larger businesses has suffered a less dramatic decline, which has been coupled with an increase in the average acreage. In California, the number of cut flower growers has declined 28% since 1993 (see Table 1, page 3). Figures for the total greenhouse area in California do not distinguish between cut flower production and other uses, but the total area is down 10%, probably largely because of declining greenhouse cut flower production. (See Table 2, page 3).

Cut flower growers have responded to competition by diversifying their crops. Flowers other than roses, carnations, and chrysanthemums now represent 84% of wholesale cut flower sales, compared to just over 50% in 1993 (see Figure 2, page 3). The willingness of California growers to diversify may account for an increase in their share of U.S. cut flower production, from 58% in 1993 to 69% in 2001. Production of a large number of minor crops has prevented a collapse of the

industry, but growers face new pressures. Information about production methods for minor crops is scant, and receipts from sales of such crops are not sufficient to support university minor crop research. Moreover, prices for most of the minor crops fluctuate more than for the major cut flowers because the market is smaller and their prices are highly sensitive to changes in volume of production.

The large quantities of inexpensive imported flowers tend to keep flower prices low. Overall, cut flower prices in 2001 were down 6% from the year before, and down 10% from 1998. Colombia and Ecuador account for most imports. In 2001, the two countries supplied the U.S. with 731 million carnations and over 1.1 billion roses. But as other flower crops become more established in the marketplace, production of those increase in South America, too. For example, they shipped 170 million alstroemeria stems and 41 million gerberas. There has also been a substantial increase recently in production of asters, daisies, delphinium,

liatris, lisianthus, and statice. In contrast, export of domestically-produced flowers has declined, probably due to the strength of the dollar against foreign currencies.

Potted flowering and foliage plant producers are making steady gains.

Imports of potted plants are limited by phytosanitary regulations, so growers contend only with domestic competition. Although the number of growers has decreased by 14% over the last decade (Table 1, page 3), the wholesale value of potted flowering and foliage plant sales has increased 11% since 1993 (Table 3, page 3). This increase is distributed approximately equally among flowering plants and foliage.

Nursery crops are driving the growth of ornamental production in California.

During the past several years, low interest rates and a strong economy have stimulated development of new housing and business, which in turn has increased demand for landscape plants. The California nursery industry has benefited greatly. Sales of

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Trends

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bedding plants are up 30% since 1993, even after adjusting for inflation (see Table 3). Sales of trees and shrubs has increased by over 50%. California nurseries supplied 28% of sales, twice as much as any other state.

The outlook. Several factors such as the slow economy and increasing energy costs are likely to limit growth of all sectors of the California ornamental production industry in the next few years. The cut flower industry may face greater foreign competition as imports of both major and minor crops increase. Rose imports from Colombia and Ecuador this year are 40% greater than at the same time last year. Potted plant production may benefit from a recent surge in consumer interest in orchids and spring-flowering bulbs. The future for California nurseries should be bright. Although nursery sales decreased nationally between 2001 and 2002, bedding plant sales by California growers was up 5% and California continues to be a major producer of trees and shrubs.

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2000 County Agricultural Commissioners' Data (and preceding years). Agricultural Statistics Service, California Department of Food and Agriculture. Order by calling (916) 498-5161 or download the document from the internet address <http://www.nass.usda.gov/ca/bul/agcom/indexcav.htm>

Table 1. Number of floriculture crop producers in California. Data from *Floriculture Crops Summary*, USDA.

Crop	1993	2001	% Change
Cut flowers	860	615	-28
Potted flowers & foliage	4616	3940	-14

Table 2. Greenhouse and field area for floriculture crop production in California. Data from *Floriculture Crops Summary*, USDA.

	1993	2001	% Change
Greenhouse (in millions of square feet)	111.7	101.0	-10
Open ground (acres)	7445	7608	+2

Table 3. Wholesale value (in millions of dollars) of selected ornamental horticulture crops in California. Data from *Crop Reports*, compiled by California County Agricultural Commissioners.

Crop	1993	2000	% Change*
Cut flowers	245.4	288.4	-1
Potted flowers & foliage	209.5	276.8	+11
Orchids	16.4	29.6	+51
Bedding plants	216.4	341.4	+32
Ornamental trees & shrubs	416.2	772.0	+56

* after correction for inflation

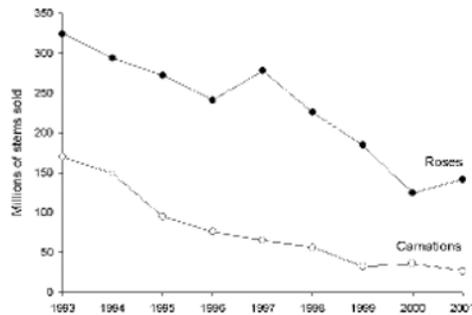


Figure 1. Number of cut rose and carnation stems sold by California growers. Data are from the USDA's *Floriculture Crops Summary*.

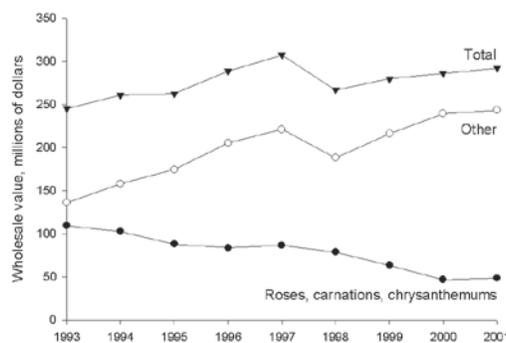


Figure 2. Wholesale value of California cut flowers. Values for crops other than roses are calculated from the difference between total value and the combined value of roses, carnations, and chrysanthemums. Data are from the USDA's *Floriculture Crops Summary*.

Generation X

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also win their approval.

Gen Xers also have distinctive color preferences. For this group, bright, cheery colors—yellow, red, orange, hot pink—are the order of the day. Rather than pastels, many are excited by bright combinations, such as bright orange and bright purple. The men in this age group are also more adventurous, choosing colorful, exotic bouquets for their girlfriends.

Fortunately, California growers specialize in many flowers that resonate with this generation. Vividly colored pincushions, protea, and cymbidium orchids cater simultaneously to their thirst for color and novelty. Another color trend among young women, says Morrill, is a fascination with dark, deep reds, maroons, and purples. Even young brides are choosing deep rich colors of burgundy, blue and purple, with no change in value. This preference is contributing to demand for the Gothic-looking, dark red rose ‘Black Baccara.’

Successful marketing to Generation X may call for tweaking a product line and shifting your marketing approach, but considering the power of their demographics, they would be well worth the effort.



IPM Update—How Good is Your Spray Coverage?

Many reduced-risk and traditional ornamental insecticides must come in contact with the insect to be effective. This contact can be either direct, for example, with the soaps, or ingested by the pest, for example, with the stomach poisons. Either way, your best chance of reducing the pest population is getting the pesticide to the pest. Good spray coverage is the key.

Do whatever is necessary to get good pesticide coverage while complying with label instructions. This may include increasing spray volume and pressure and using electrostatic sprayers. Sometimes you can get away from covering the entire plant by applying the pesticide only to the “areas that count.” For example, aphids tend to congregate on newer leaf tissue or buds, so direct your spray there.

Your scout should be able to tell you where the pests are located, not only by section of the growing area but also location on the plants.

Another thing that is handy is the use of water sensitive cards. These small yellow cards are placed in the plant canopy and turn blue wherever water contacts them. They are also great if you need to monitor for spray drift. Your local pesticide dealer should be able to supply them. If not, contact me (cawilen@ucdavis.edu) for the name of a mail-order supplier.



*Cheryl Wilen, Area IPM Advisor
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Regional Report

San Mateo & San Francisco Counties

Postharvest Temperature Control



Moving fresh flowers and potted plants quickly from the field or greenhouse to the final

consumer is critical in the floriculture industry. This means that flowers must be harvested, handled, and shipped rapidly, and precooled adequately to assure good quality. Flowers need to be cooled **before** leaving the nursery, and must be held at proper low temperatures during shipping. If California growers could do this, the postharvest quality of their flowers could easily surpass that of imports.

The biggest problem I see in some nurseries is that they do not adequately precool their material before it leaves the nursery. Given that they are moving large numbers of flowers and plants in a short time, especially at holidays, this is understandable. Sometimes there is just not enough time or cooler space to get the job done. However, there are steps that can be taken to properly reduce plant temperature.

What temperature? The majority of flowers should be cooled to 32°F (0°C) and held at that temperature during transport. In looking at cold room temperatures in nurseries, it is common to see them at 40 to 45°F, or higher (!), which is too warm. Studies by Michael Reid have shown that cut flowers held at 32°F last 4 to 8 times longer than those held at a “cool” 50°F! Those few extra degrees really do make a difference.

The only exception to this is with plants which are chilling-sensitive. Some subtropical foliage plants and a few flowers (anthurium, bird-of-paradise, ginger, tropical orchids) are damaged by temperatures below 50°F (10°C). These plants should be precooled and shipped at 50°F. To avoid chilling injury, try to avoid mixed

loads with chilling-sensitive plants.

Cooler maintenance. Take the time to measure the temperature in your coolers. Do this frequently. Narrow the temperature range at which the cooler turns on and off – this will keep the room cooler, and avoid having it get too cold (and risk freezing the flowers). Stress to workers the importance of keeping cold room doors closed whenever possible. It is usually a good investment to have a refrigeration company perform regular maintenance checks. The June 2001 issue of *FloraCulture International* has a good article on purchasing coolers and how growers can maintain them.

Precooling of cut flowers vs. potted plants. Cut flowers should be graded, packed, precooled, and shipped as soon as possible. Forced-air cooling is recommended on boxes of cut flowers to quickly reduce the temperature. Potted plants present a greater challenge – forced-air cooling does not quickly reduce the temperature in the soil mass, nor does placing the plants in coolers. Growers often skip cooling on potted plants (which reduces the postharvest life), or they hold plants in a cooler for as long as possible before shipping (this rarely lowers the temperature enough). Nevertheless, potted plant growers should reduce temperatures as much as possible before shipping. Michael Reid and I will soon start a study to examine whether vacuum cooling works for the potted plant industry.

Seal the boxes properly. All too often, costly insulated boxes are used for cut flowers, but hurried workers may not seal them properly, which greatly reduces the insulating properties. It is worth the few extra seconds to make sure that boxes are sealed properly and that forced-air cooling flaps are closed.

Deliver into cooled trucks. Truck containers should also be precooled and kept cool during shipping. Cooled

flowers placed into a too-warm truck will not arrive in satisfactory condition after a multi-day cross-country shipment. It is worth the investment to contract with trucking companies that assure refrigerated shipping temperatures (“refrigeration” is often above 40°F, which is not low enough). If in doubt, work with the company to periodically use temperature recorders in some boxes during shipping. After shipping, you can look at information from these recorders to see the temperature fluctuations during shipping.

Avoid fluctuating temperatures. Of course, flowers should be kept cold during shipping, but this is not always possible. Intermittent warm temperatures directly reduce postharvest life, but warm temperatures also contribute to diseases such as botrytis. The condensation that occurs when flowers in plastic sleeves are cooled, then warmed, is an ideal breeding area for postharvest diseases such as botrytis. Keeping the temperatures low avoids condensation.

Want more information? The newly revised UC publication, *Postharvest Technology of Horticultural Crops* (#3311, 3rd edition, 535 pages, \$65, 2002), is a comprehensive guide to the postharvest handling of fruits, vegetables, and flowers. It stresses fruit and vegetable crops, but the few chapters on ornamental crops are worth reading. To order, call ANR Publications at (800) 994-8849, or contact <http://anrcatalog.ucdavis.edu>

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Regional Report

Santa Cruz & Monterey Counties

UC and Industry Teamwork Solves Foxglove Mystery



The adjacent *Observation* column describes the finding of an important new disease on foxglove found recently in several local nurseries. A larger disaster was averted by the quick teamwork of several members of the industry. The following is an abbreviated summary of the disease discovery and the important communication that took place - a story of successful teamwork.

The story begins with a message on my answering machine... A nurseryman reported a severe disease on his potted foxglove crop. "Never seen anything like this before," he exclaimed. I was at the nursery in a flash. The detective work began. What cultivars of foxglove were affected? When did the grower notice the problem? Where did the plants come from? Ahh, to the propagation house. Yikes, the disease is in the propagation house! Where did those seed come from?

Back in the diagnostic lab at my office... I'm looking through the dissecting microscope at what appears to be a downy mildew on the foxglove leaf sample. A local pest control advisor stops by with an unrelated plant sample for me to look at. I have him look at the conidiophores and conidia of the foxglove pathogen placed on a slide under the compound microscope. "Cool!" the PCA exclaims, and he is eager to know more about the problem.

I'm out in our office courtyard documenting the crime with pictures...hunched over the diseased plants and straining to see the LCD image of the diseased leaves in the bright sunlight. A horticultural products salesman stops by to see me. He finds me picking apart and scrutinizing the diseased plants in the courtyard. "Oh, is this the scientist at work?" he says in a loud voice, startling me out of my wits. I show him the plants. Yikes, he saw this problem in a northern California nursery just a few days ago! The plot thickens. The salesman gets on the phone to his nursery client to ask more questions.

I receive a voice message from the pest control advisor... After visiting me that morning, the PCA has visited a cut flower

grower and another nurseryman. Both have foxglove with symptoms that match the original symptoms he saw in my diagnostic lab! The PCA has the growers call me. The plot thickens again. This is a serious problem; what is it?

The diseased plants get to Steve Koike, UCCE plant pathology farm advisor.... "I think you're right, it looks like a downy mildew," Koike says as he examines the fungus under his dissecting microscope. Measurements are made of the size of the conidiophores and conidia, information that is needed to identify the fungus. References and online information are searched. There is a published report that identifies a downy mildew on foxglove and it matches our specimen! The plot thickens again. The disease was only described for Europe, Asia, and New Zealand. Yikes, this is a newly discovered disease for the United States!

The published information is faxed to pest control advisors, impacted growers and others... The culprit is on the loose but the pathogen has a name now, *Peronospora digitalidis*, and we know the disease is caused by a downy mildew pathogen. Now some powerful decisions can be made about control. The growers rogue plants and in some cases spray fungicide.

The story continues today. Questions still need to be answered. Did the pathogen come from seed? What is the most appropriate fungicide control? The growers are following the leads to where they obtained seed. Maybe we will find a common infected source. We will need to work on fungicide treatments. We have retained infected plants to begin work on treatments this fall. Chemical companies will be supplying experimental products for these tests.

All an example of teamwork: the University of California, floriculture and nursery growers, and allied industry working together for a common goal.

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Field Observations

First occurrence of downy mildew on *Digitalis purpurea* (common foxglove), caused by *Peronospora digitalidis*, in California and the United States

In May 2002, I observed severe downy mildew on potted common foxglove plants in several commercial nurseries in Santa Cruz County. At the same time, other observers noted the disease on foxglove used for cut flowers in Santa Cruz County and potted plants in a northern California nursery. After the discovery of the disease in commercial nurseries, I found the disease in my own backyard on a potted plant recently purchased from a local retail nursery. The pathogen had already been distributed to the retail market. The overwintering nature of this plant might allow the pathogen to survive in home gardens.

Initial symptoms on leaves consisted of light green, rectangular areas that were vein-delimited and measured 2 to 5 by 8 to 12 mm. Such spots later became chlorotic. As disease progressed, chlorotic spots coalesced and turned necrotic. Under favorable conditions, the purple-gray sporulation of the pathogen could be seen primarily on the bottom of the leaf surfaces. However, in some cases extensive fungal growth developed on the upper surfaces of lower leaves. The pathogen was identified as *Peronospora digitalidis* by S. Tjosvold and S. Koike.

D. purpurea cultivars such as 'Alba', 'Apricot', and the Foxy hybrids appeared to be most susceptible; *D. x mertonensis* (= *D. grandiflora* x *D. purpurea*) appeared to be moderately susceptible; and *D. grandiflora* grown in the same area was symptomless. A planting of the Foxy hybrid was 100% infected and the entire lot of several hundred plants was discarded. The disease was also found on the Foxy hybrid seedlings grown in propagation greenhouses.

This appears to be the first report of downy mildew caused by *P. digitalidis* on cultivars of *D. purpurea* in California and the United States. This disease has been reported previously in Europe, Asia, and New Zealand.

I can send anyone an image of the disease via email. Just ask.

Regional Report

Ventura & Santa Barbara Counties Reflective Mulches and Covers on Solidago

Field Observations

Glassy-winged Sharpshooter (GWSS)

Last year several growers who made pesticide applications in nurseries before shipping had plants rejected upon arrival due to hitchhiking GWSS. For this reason, Ian Greene (formerly of Whitmire), John Kabashima (UCCE, Orange County) and I evaluated an aerosol application of fenprothrin (AttainTR) made in trailers prior to shipment. Although we had good success with this treatment, so far Whitmire has not indicated interest in a third party 24C registration, as originally anticipated. In the meantime, local nurseries shipping into northern California continue to lose millions of dollars due to this pest. There are many pesticides that are effective in controlling adults and nymphs. However there are no true ovicidal materials and only a few pesticides will kill the hatching nymphs as they emerge from the eggs. Of these materials, only Sevin (carbaryl), DeltaGuard (deltamethrin) plus Tactic (spread-sticker), KnoxOut (diazinon), Tame (fenprothrin) and Marathon II are currently registered for this use. Results from Rick Redak's lab (Dept. of Entomology, UCR) showed that Marathon II did not perform as well in the field as in lab studies. Other effective pesticides [e.g. Mesurool (methiocarb), Pedestal (acetamiprid)] are not registered. Aventis hopes Pedestal will be registered in California by summer's end. Although there are surprisingly few monies available to support research for the control of GWSS in ornamental crops, recently I received a research contribution from C.A.N, through a donation by the Channel Islands Chapter. I have had good preliminary results with the use of reflective mulches in reducing colonization of GWSS on container nursery stock, and plan further evaluations of reflective mulches and/or plant covers this summer, as an additional tool to use along with pesticides.



Plastic mulches and plant covers with reflective surfaces can be an effective reduced-risk

management tool for growers to incorporate into IPM programs. Evidence to support this continues to come in from our evaluation trials, where we have examined the use of this technique on a number of ornamental crops. This is a project currently sponsored by the Department of Pesticide Regulation that I am working on with Dr. Karen Robb, UCCE Floriculture and Nursery Advisor in San Diego County.

In this issue of *CORF News*, I am reporting results over two crop cycles on goldenrod (*Solidago* 'Yellow Submarine') in a commercial cut flower field in Oxnard, Ventura County. Three adjacent rows of reflective covers were used in each plot, and data were collected only from the middle rows. Each week we counted all weeds found in center plot grids, as well as pests found on sticky traps and on plant samples collected from each plot. Plant samples consisted of leaves collected from low, middle and upper plant canopies, in addition to a terminal tap for thrips. Treatments were reflective ground mulch, reflective plant cover, a combination of ground mulch with plant cover, and uncovered rows (control); there were three replications per treatment. We also measured light levels, soil temperature, fresh plant stem weights, and stem length in each plot. A rating scale of 1-5 was used to evaluate crop quality.

In general, the reflective treatments had fewer pests than the control, with differences for aphids, thrips and leafminers on sticky cards and for aphids and whiteflies on plant samples. In a previous study on aster, we reported that the plant cover and combination

treatments were consistently more effective than the ground mulch. The reflective ground mulch protected the crop initially, but effectiveness was reduced when the plant canopy covered the mulch. Similar results were obtained in this study on goldenrod, however the ground mulch was somewhat better than the plant cover in reducing whiteflies on leaves collected throughout the crop cycle. In both aster and goldenrod, pest control results in the cover treatment were generally similar to the combination treatment. However, in the aster study, the combination treatment was better than the cover treatment alone because it reduced weeds, an important benefit for growers, especially with the imminent elimination of methyl bromide. In the goldenrod study there were few weeds even in the control plots.

Some growers have been concerned that reflective plant covers will shade the crop, with detrimental effects. Indeed, on cloudy days the light levels we measured underneath the plant cover were reduced >20% and temperatures averaged 0.7 degrees F cooler. Fortunately, however, it does not appear that reduced light levels affected plant quality, at least in the case of *Solidago* and other crops we have examined so far. In fact, in January when light levels were reduced, the *Solidago* plant stems under the reflective plant cover treatments were heavier and >2.5 inches longer, a bonus since florists prefer longer stems! We have seen no other measurable plant quality differences in *Solidago* and by May there were no stem length differences.

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Regional Report

San Diego County

Water Quality Programs Continue



Our general program of grower education and individual consultations is continuing and we are in the process of securing additional funding

to expand this program. In addition, we are initiating other water quality programs.

Water Quality Record Keeping

Valerie Mellano, Dave Shaw, Diane DeJong and I have prepared a draft 'Water Quality Record Keeping' system to aid growers in meeting requirements of future storm water and runoff inspections. Provisions of the Stormwater Permit require that inspections of commercial operations occur, including agricultural operations. Each city and the county are responsible for inspecting businesses in its own jurisdiction.

The record keeping system utilizes, as much as possible, information that is already required of growers, such as monthly Pesticide Use Reports and Hazardous Materials Business Plans. This system is designed to help growers organize and document the best management practices they have implemented. The record keeping format is an easy to reference notebook to which materials can be added. Topics include Site Map, Hazardous Materials, Sanitation and Waste Management, Pesticide Use, Fertilizer Use, Irrigation Practices and Runoff Management, Best Management Practices Implemented on Site, and Educational Programs. Since it is anticipated that inspections will be conducted annually, it is recommended that growers keep at least 12 months of records available.

Draft versions are currently under review and are expected to be completed by the end of June. This record keeping system will be available in hard copy or on disk.

Farm Worker Water Quality Education Program

This program targets agricultural workers who are in charge of the watering, fertilizing and other activities that can all have an impact on runoff. Clearly, all the hardware improvements possible will have no impact if the irrigator persists in using too much water, or if greenhouse floors are cleaned by being washed down instead of swept. Our experience with other programs indicates that once workers are educated about the overall importance of the practices they are being trained in, there is significant buy-in to the project.

This program will begin this summer in English, and we will have a Spanish program later in the year. Program delivery will take place on-farm. Topics to be covered include: importance of water quality, proper irrigation practices, nutrient management, erosion control, and other pertinent topics.

Nutrient Utilization Study

Over-fertilization and the subsequent release of nutrients to the ground and surface water is one of the largest concerns of the regulatory community and also of the nursery industry. However, there is very little known about the nutrient requirements of most of the ornamental crops grown in San Diego County, so we are initiating a research program to define some of these requirements. This program will be conducted with both grower cooperators and also at the South Coast Research and Extension Center in Irvine. It is a joint effort between UC Cooperative Extension, UC Davis and UC Riverside.

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Field Observations

Winter and spring 2002 have been extremely dry, cool and mild in San Diego County. This could easily be a record breaking year for drought. The good news *should* be that dry years are not conducive to rust diseases. However, the reality is that rusts have been very problematic this year. Ten nurseries in the county have been quarantined for daylily rust, chrysanthemum white rust or English daisy rust, all of which are 'Q' rated pests. There is an effort to downgrade English daisy rust from a 'Q' pest to a 'C' rated pest, as this rust is apparently established in California. For now, however, it is still a 'Q' rated pest.

All nurseries are currently off the various rust quarantines. Not that we are out of the woods for rust diseases, mind you. I just saw a glorious example of rust on vinca (note that this is also a 'Q' rated pest!).

In general, rusts are favored by moderate temperatures. Water on the leaves is required for short periods (6-8 hours or less) for germination of the spores and infection to occur. Once infection has occurred, water is no longer needed for development of the disease. Continued development, infection and spore production will continue for the life of the leaf.

Cultural control methods include not replanting crops in the same soil season after season and avoiding overhead irrigation.

The cool spring meant lower insect pest pressure for most growers in the county. Just recently, however, the weather has warmed considerably and insect pests are increasing dramatically.

Growers' Views

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bamboos; hardy to subtropical vines; flowering perennials; grasses and grasslike plants; bulbous, cormous and tuberous perennials, and ferns. They offer a number of familiar plant selections in high demand. However, their special focus is evaluation and distribution of worthy new plants, and helping to revive interest in those plants that have been neglected over the years.

Stan Iversen, the president of this progressive nursery, says his markets have not changed substantially and he has no plans to change his marketing strategies. "The same market trends over the years are still in effect. Always color, everything has to be in blossom." Stan adds, "There has been a push for 4 inch container color from the 6-packs. Also, there are the combination pots, mixing 2 grasses and 3 perennials in a pot." Stan has produced those commodities before but he finds that they do not mix well with his present product mix. "Those

products require different handling and maintenance practices than we generally use."

When asked if he worries about the Home Depots and Wal-Marts driving down wholesale prices with their high visibility and ultra low prices, Stan states, "We just don't get into growing those products so we don't have to compete." The strategy by these retailers of ultra low prices is almost comically evident. Stan laughs, "A wholesale nursery friend of mine sells to one of the big retailers. The big retailer told his nursery friend, "Your prices are too high, but I sure like your quality." Begrudgingly, the retailer continues to buy.

Rene Van Wingerden, of **Ocean Breeze International**, producers of greenhouse and field grown cut flowers, sees the market arena becoming increasingly dominated by supermarkets. "Mass markets are much

more concerned about keeping prices low than with offering quality flowers." As a result, Rene feels his business may be forced to cut corners. "Consumers need more education because they don't realize that they are trading low prices for quality. A diversity of market choices is important."

Silver Terrace Nursery in Pescadero and San Francisco, grows, ships, and wholesales cut flowers. **Robert Ruggeri**, co-owner and vice president, saw major changes in floral marketing in 1977. At that time, supermarkets began wide marketing of floral products, and Silver Terrace began selling carnations, their main crop at that time, to supermarkets.

In the 25 years since, Silver Terrace has diversified its product line to many different flowers, and it no longer sells primarily to supermarkets. Ruggeri also

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notes that the major supermarkets are not concerned about where the flowers are grown or their freshness. The supermarket industry is so cost-competitive that he cannot make money selling to supermarkets. They also do not offer the variety selection or postharvest quality that California growers can provide.

Ruggeri notes that to stay competitive, his marketing plan is to remain "vertically integrated." Silver Terrace grows, ships, and wholesales its own and locally-grown flowers, does limited importing, and tries to find new niche markets (like organic bouquets). He stresses the advantage of maintaining their own shipping market, in that it allows him to provide fresh California-grown flowers with good postharvest life. He notes the importance of finding the next hot item to grow, but that market research is difficult, and the retail demand for flower varieties changes too fast for growers to keep up. Overall, he focuses on growing high quality flowers and crop variety.



Get Cultured—What is pH?

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

When it comes to crop production, the pH of soil and water is one of the most important chemical factors to consider aside from nutrient concentrations. The primary factor that pH influences is nutrient availability. If the pH is incorrect, nutrient solubility and availability to plant roots may be impaired.

What is pH?

The pH is the measure of acidity (H^+) or alkalinity (OH^-) of a soil solution or irrigation water. Chemically speaking, it is the measure of hydrogen ion (H^+) concentration in the solution. The lower the pH, the higher the concentration of H^+ (Figure 1). A logarithmic scale is used (Figure 2) since the H^+ concentration increases 10 times for every unit change on the pH scale. For example, a pH of 1 has 100 mg of H^+ ions for each liter of liquid while a pH of 2.0 has 10 mg of H^+ per liter of liquid and pH 1.5 has 30.16 mg of hydrogen ions per liter of liquid. The actual equation is $pH = -\log(H^+)$.

Changing solution pH. There are three ways to change the solution pH:

1) **Add H^+ ions** - through the direct addition of acids such as hydrochloric acids (HCl), or sulfuric acids (H_2SO_4). These elements in these compounds separate when mixed in water. For example, when HCl is added to water (H_2O), H^+ in HCl separates off the Cl forming 'free' H^+ and 'free' Cl^- in the water. The word 'free' means that the ion is dissolved in solution and is not connected to another element or compound.

2) **Add compounds that react with H_2O to form 'free' H^+ ions.** This occurs with elements like aluminum (Al). When Al reacts with some of the water molecules, H^+ is released into solution as shown in the following equation: $Al + H_2O = Al(OH) + H^+$.

3) **Remove hydrogen ions from solution** - through the addition of base-forming compounds such as sodium hydroxide ($NaOH$) and ammonium hydroxide (NH_4OH). These compounds react in solution in a way that reduces the amount of free H^+ ions. As you can see in the last part of the following equation, the 'free' OH^- and H^+ react with each other to form water (H_2O). For example, $NaOH + H^+ + H_2O = Na^+ + OH^- + H^+ + H_2O = Na^+ + 2H_2O$.

Now that the chemical properties of pH have been explained, we will discuss how nutrient availability of soils is influenced by pH in the next issue of *CORF News*.

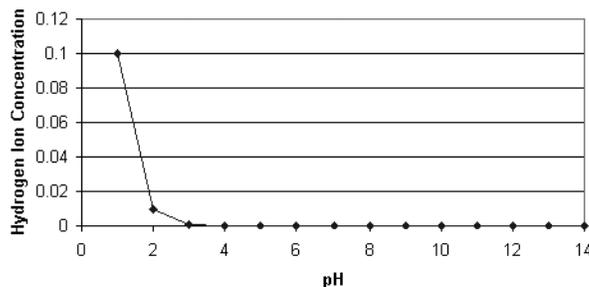


Figure 1. This graph shows the pH of a solution as it relates to hydrogen ion concentration (H^+). The pH is on the horizontal line (x-axis) and ranges from 1 to 14. The H^+ concentration is on the vertical line (y-axis) and ranges from 0.12 mole/liter at the top and goes down to 0 moles/liter at the bottom. As you can see, it is very difficult to read the concentration of H^+ after pH 2. In order to read the graph, you would have to make an excessively long vertical scale or convert this to a logarithm as shown in Figure 2.

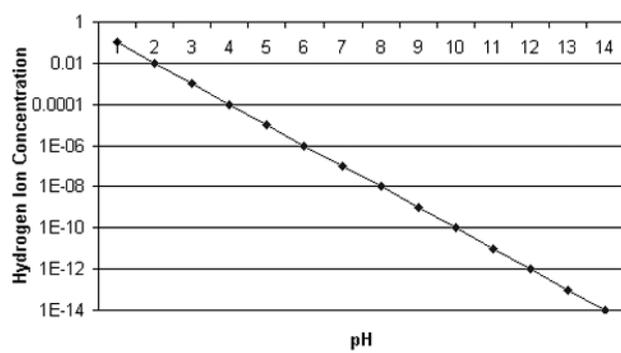


Figure 2. This graph shows the pH of a solution as it relates to hydrogen ion concentration (H^+) on a logarithmic scale. The pH is on the horizontal line (x-axis) and ranges from 1 to 14. The H^+ concentration is on the vertical line (y-axis) and ranges from 1 mole at the top and goes down to 1×10^{-14} at the bottom. The $1E-05$ is just an abbreviation for .00001. The -05, -06 just indicates the number of spaces from 1 that the decimal was moved. For example -05 and -06 means 5 and 6 decimal places to the left of the 1.

Campus News & Research Updates

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

UCDAVIS

A full day Pest Management Evaluation meeting was held March 20, 2002 in Carpinteria with funds secured from the California Department of Pesticide Regulation (DPR) by **Dr. Parrella**, Dept. of Entomology. The purpose of the pest management evaluation was to provide background information on current pest management strategies for gerberas grown as cut flowers in California. This information will be used to develop a proposal that will form the basis for a Gerbera Pest Management Alliance, which would eventually demonstrate and implement a reduced-risk pest control strategy for this crop similar to what has been done on roses. Carpinteria is the center of gerbera production in California, and more than 90% of the gerbera acreage in the state was represented at this meeting, including 18 growers from 11 nurseries. Also attending the meeting in addition to Dr. Parrella were **Roy Kaspi** and **Tom Costanagna** (Dept. of Entomology); Farm Advisors **Steve Tjosvold**, **Julie Newman**, and **Karen Robb**; **Richard Lindquist** (Olympic Horticultural Products); **Lee Murphy** (California Cut Flower Commission); **Paul Penza** (Western Farm Service); **Laurie Constable Beatty** (United Horticulture Supply); **Gidus Hopmans**, Terra Nigra; **Greg Fukumitsu**, Syngenta; **Dan Cahn**, and **Heidi Petersen** (Syngenta Bioline); and **Roger Haring** (Plant Sciences, Inc.). The Alliance will meet again (likely in the fall), and will be discussing ideas for a full proposal that will be submitted to DPR. The Alliance is not closed by any means, and anyone interested in getting involved is invited to contact Dr. Parrella (e-mail: mpparrella@ucdavis.edu).

A group of approximately 100 invited scientists from academia and industry gathered recently in Monterey to discuss concerns and opportunities facing horticultural biotechnology. A key concern addressed at the meeting is why horticultural crops lag behind many field crops when it comes to taking advantage of biotechnology for creating new products or marketing existing ones that

have been developed using genetically modified organisms (GMOs). The workshop was developed by the Agricultural Issues Center and the Seed Biotechnology Center. Key organizers included **Julian Alston**, associate director of the Ag Issues Center and professor of agricultural and resource economics; **Kent Bradford**, director of the Seed Biotechnology Center and professor of vegetable crops; and **Peggy Lemaux**, CE biotechnology specialist (at UC Berkeley). Participants agreed that ongoing dialogue is needed among the key players if these issues are going to be solved. They suggested that the horticultural industry must move beyond "first generation" products that have largely focused on pesticide and herbicide resistance in plants to ones that have more direct consumer benefits. These might include such products as uniquely colored flowers, and roses and other flowers with enhanced fragrance.

Mark your calendar for August 15-16, 2002 for the 3rd California Conference on Biological Control at the Buehler Alumni and Visitors Center. The purpose of the conference is to promote biological control and facilitate contact between biological control practitioners and researchers in California. Of special interest to California growers is a session on reduced risk pesticides and compatibility with biological control agents. Other session topics include transgenic crops; invasion biology; and invasive species as targets for biological control. For more information, contact the College of Agricultural & Environmental Sciences Dean's office at CCBC3@agdean.ucdavis.edu (e-mail) or 530/752-1606 (voice). You can also visit the CCBC III web site at <http://biocontrol.ucr.edu/>. ❖

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Science for the Grower

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

Management of relative humidity has always been deemed important by rose growers, but effects of relative humidity on growth and flower quality have not received much study. A group of Norwegian scientists has reported the effects of both relative humidity and the ratio of potassium and calcium on growth and postharvest life of roses (Torres, et al.). They grew own-root 'Baroness' cuttings under winter light levels and relative humidity of either 70% or 90%. Potassium in the nutrient solution ranged from 43 to 380 ppm, and calcium from 32 to 208 ppm. (Note: normal levels are about 150 ppm for potassium and 100 ppm for calcium.) Relative humidity did not affect flower yield or shoot length, but high humidity shortened subsequent vase life by causing wilting and bent neck. The ratio of potassium to calcium had little effect on growth, but flowers with little calcium in their tissue were prone to petal blackening. This response is similar that reported in the *Roses Inc. Bulletin* by Evans and Dodge in 1997, but no one has discovered a reliable way to increase calcium uptake under low light. Torre's results indicate that decreasing the amount of potassium might improve calcium uptake and reduce petal blackening. Are there any rose growers out there who want to give this a try?

Poor water uptake affects many cut flowers, especially those that have been stored dry. Several successful treatments have been found, including the incorporation of a surfactant in the solution. Based on work by Wouter van Doorn, the Dutch flower auctions have required treatment with Agral-LN (Nonoxynol-8.5) for several years. However, Agral resists biodegradation in sewage treatment systems and can no longer be used. Van Doorn's group recently reported the response of cut flowers to surfactants that are rapidly biodegradable. Cut flowers were treated with 11 different surfactants, stored dry, then placed in water. Both roses and *Bouvardia* flowers rehydrated well in certain alkylethoxylate surfactants. A commercial mixture of them, Atlas G 2130, was effective at lower concentrations than any other surfactant (1 ppm for roses and 500 ppm for *Bouvardia*). Atlas surfactants are a product of Uniqema, part of the ICI Group.

Reference:

Torre and et al., 2001. Effects of air humidity and K/Ca ratio in the nutrient supply on growth and postharvest characteristics of cut roses. *Scientia Horticulturae* 90: 291-304.

Van Doorn et al., 2002. Alkylethoxylate surfactants for rehydration of roses and *Bouvardia* flowers. *Postharvest Biology and Technology* 24: 327-333.



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. Reproducing and distributing material from this newsletter is encouraged, provided credit is given to the author and *CORF News*

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Calendar of Industry Events

July

4-8 AIFD Symposium, San Diego,
 831/724-1130
 10 KKRF Endowment Dinner, Santa
 Barbara, 831/724-1130
 10-13 . CAFG&S, Fun'N Sun Weekend,
 Santa Barbara, 831/722-2424
 19-21 . TSFA Annual Convention, Austin
 TX, 512/834-0361

August

3-5 FTD National Convention,
 Nashville, TN 916/448-5266
 4-6 CSFA Floriculture Retreat,
 Carlsbad, 831/728-7333
 28 CCFC Grower Education Seminar,
 831/728-7333

September

18-21 . ASCFG Annual Meeting, Madison,
 WI, 440/744-2887, www.ascfg.org
 19 CORE, Technology Growers' Tour,
 San Marcos, 831/724-1130,
 www.corf.org
 25-28 . SAF Annual Convention, Phoenix,
 AZ, 800/336-4743,
 www.safnow.org

October

10 CORE, IPM Strategies, Watsonville,
 831/724-1130, www.corf.org

November

14 CORE, Floriculture & Nursery
 Marketing, Watsonville, 831/724-
 1130, www.corf.org

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