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GROWING Points

Department of Environmental Horticulture • University of California, Davis

California Cut Roses: Production and Preservation - Part II

Integrated Pest Management Holds Promise for Growers

By Christine Casey, Graduate Research Assistant, Brook Murphy, Postdoctoral Researcher, and Michael Parrella, Professor and Chair, Department of Entomology, UC Davis

As noted in Part I of this series, cut roses are an important flower crop in California. The demand for high quality stems and flowers has traditionally been met by frequent pesticide applications that prevent injury from insects, mites, and diseases. Concerns about human and environmental health, however, have resulted in increased regulatory and public pressure to encourage growers to reexamine their pest control methods.

Figure 1. *A greenhouse worker applies the insect pathogen Beauveria bassiana to roses for western flower thrips control. Note that this material is applied using a conventional sprayer.*

An important regulatory change that would affect pest control practices occurred in 1995 when Worker Protection Standards (WPS) required reentry intervals of 4 to 24 hours (and as much as 48 hours in a few cases) after pesticide application. Because they harvest several times a day, however, rose growers received a 2 to 3 year exemption from the WPS that allows early reentry for harvesting.

Then in 1996, Congress passed the Food Quality Protection Act (FQPA). FQPA mandated a safety review of many commonly used pesticides, including several used by rose growers. Because the greenhouse industry is small compared to others such as the corn or cotton industries, performing the studies needed to keep rose crop pesticides on the market may not be cost effective for manufacturers. As a result, some materials may be removed from the market or replaced by alternative chemicals. Although the final outcome of these regulations is not clear, the likely result is that fewer pesticides will be available to rose growers.

Many newer pesticides pose lower risks to human and environmental health because they are based on natural compounds or only affect metabolic processes specific to insects. These materials do not require review. As the FQPA process moves forward, these *reduced risk pesticides* may remain the only pesticide option for rose growers.

Unlike the pesticides most rose growers currently use, reduced risk pesticides tend to: have shorter reentry intervals, work more slowly, target specific pests, have short residuals, and have little impact on beneficial insects. Because of these characteristics, reduced risk pesticides work best when used as part of an IPM program.

In This Issue...

Figure 2. *Western flower thrips injury to a rose flower*

What is Integrated Pest Management?

An IPM approach to pest control centers around the idea that some level of pests can be tolerated on a crop without affecting the quality of the crop. IPM practitioners monitor their crops regularly for insects, mites, pathogens, and weeds and only use pest control when this threshold level of pests is exceeded.

To maintain acceptable pest levels, biological control, environmental control, modification of cultural practices, mechanical control, regulatory control, resistant varieties, and the judicious use of pesticides are combined to create a cost-effective pest control program. Many greenhouse IPM programs have achieved reductions in pesticide use, but the integration of biological and chemical control has been more difficult because many conventional pesticides harm natural enemies.

Rose growers have been slow to adopt IPM methods. Many are unfamiliar with non-chemical pest control strategies and are not certain they will be as effective or as economical as the chemical methods they currently use.

Growers are also wary of thresholds. The notion that there is a level of pests that can be tolerated without affecting flower quality has been slow to gain acceptance because of the high aesthetic standards of the cut rose market.

In addition, more information on thresholds is needed for rose IPM programs to be developed. While accepted threshold levels are known for many pests of food and forage crops, there are none for greenhouse pests, as little research effort has been directed to this area. This complicates the development of sampling plans (a necessary part of a plant-scouting system for greenhouse pests), since these work best when based on a knowledge of pest thresholds.

Potential conflicts between different types of pest control practices used in IPM programs also present a challenge to rose IPM practitioners. For example, predatory mites used to control the twospotted spider mite (a key greenhouse rose pest) may be harmed by sulfur that is used for powdery mildew control, but helped by the new cultural practice of canopy bending. Effectively combining chemical and non-chemical pest management strategies as well as understanding the effect of rose cultural practices on pest management is a significant challenge facing growers who wish to implement a rose IPM program.

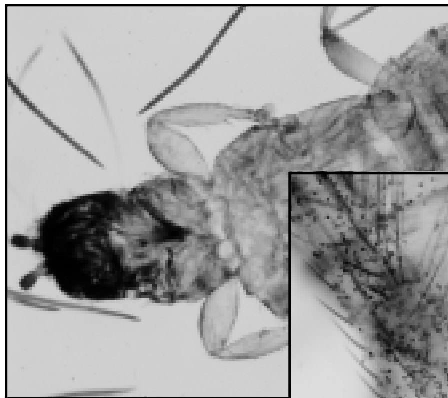


Figure 3. *Adult western flower thrips infected with B. bassiana spores.*

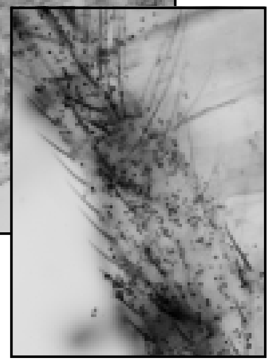


Figure 4. *Close-up of infected adult western flower thrips*

The development of reduced risk pesticides which have little effect on natural enemies presents an important opportunity for rose growers to implement comprehensive IPM programs. The opportunities presented by these new pesticides, combined with the uncertainty raised by the FQPA about the future availability of conventional pesticides, has led many rose growers to reexamine IPM as a pest control option.

Working Toward Solutions

UC Davis researchers are providing California rose growers with answers that will enable them to manage their pest problems cost-effectively using IPM methods.

The key pests of fresh cut roses are the western flower thrips (*Frankliniella occidentalis*), the twospotted spider mite (*Tetranychus urticae*) (both arthropods), and rose powdery mildew (*Sphaerotheca pannosa* var. *rosae*) (a fungal pathogen). All currently are managed with pesticides targeted by the FQPA. The western flower thrips and the twospotted spider mite also affect many other greenhouse flower and vegetable crops, so these studies will be applicable outside the rose industry.

Western Flower Thrips. The western flower thrips directly damages the rose flower. It feeds on the developing bud, causing scarring and distortion of the resulting flower (See Fig. 2). Depending on the extent of the injury, the flower may be unsalable or sold at a lower quality grade. Because of the high potential for economic loss from this insect, rose growers have typically not tolerated any thrips in their crops.

This standard has led to frequent pesticide applications that have sometimes resulted in pesticide resistance. Thus, the first step in the development of an IPM program for this insect was to determine its threshold on rose flowers. This information could be used to develop a sampling plan for thrips that would give growers an objective guideline as to when pesticides were needed.

Experiments were initiated by UC Davis entomologists in 1996 in the Watsonville and Ventura areas of California that showed that an average of one thrips per flower could be tolerated without impacting flower quality. The flower must be pulled apart to sample for the presence of thrips, however, so a method that growers could use had to be developed.

This work, which has just been completed, used a common type of insect trap called a sticky card. These cards are 3 inches by 5 inches in size, blue or yellow in color (both are attractive to thrips) and are covered on both sides by glue. As thrips move throughout the greenhouse they are attracted by the color and become caught on the trap. By counting the number of thrips on the cards and the rose flowers in several greenhouses, a relationship between the number of thrips trapped and the number in flowers was determined. When 25 Western flower thrips were caught on a card in one week, it was expected that an average of one thrips would be found on each flower. Typically, the injury to flowers caused by one thrips is too slight to detect and, therefore, does not result in economic loss.

Another important part of a western flower thrips IPM program was the development of a reduced risk pesticide for its control. This pesticide contains the fungus *Beauveria bassiana*—a pathogen that infects many soft-bodied insects such as thrips, aphids, and whiteflies, but does not affect plants. The fungal spores of *B. bassiana* germinate into the insect's body. The hyphae then grow inside the insect where they feed on and eventually kill it (See Figs. 3 and 4).

Studies at UC Davis and elsewhere have shown that this pesticide is effective at controlling thrips on many greenhouse crops,

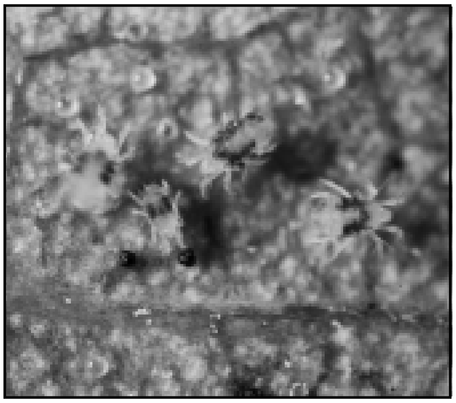


Figure 5. *Adult twospotted spider mites on stippled rose leaf*

Figure 6. *High level of stippling on rose leaves caused by the twospotted spider mite*

including roses. Because the pesticide is a living agent, it acts quite differently from the traditional pesticides with which growers are experienced. This material will take longer to kill the thrips than conventional pesticides, as it must germinate into the host. Its efficacy will be further influenced by the temperature and humidity in the greenhouse, which affect germination rate. (Lower temperature and humidity decrease the germination rate.) Since many fungicides applied for plant disease control act by inhibiting germination of fungal spores, they cannot be applied at the same time as insect pathogens. This potential conflict can be overcome by applying the *B. bassiana* about 48 hours before any fungicide.

Finally, because the insect pathogen acts more slowly than conventional pesticides, it works best when applied at low thrips populations. The thresholds developed in these experiments provide guidelines as to what “low” thrips populations really are.

Twospotted Spider Mite. The twospotted spider mite (*Tetranychus urticae*) is the other key arthropod pest that affects cut roses. It feeds on the foliage, extracting plant sap and causing a type of injury called *stippling*. Stippling may occur on the marketable portion of the rose stem. More common, though, is indirect damage to the lower portion of the plant, where mite feeding can interfere with photosynthesis. Mites tend to be found mostly on the lower portion, moving up to the marketable part of the plant only when populations are very high. There are no accepted thresholds for mites on cut roses, although clearly more mites can be tolerated on the lower part of the plant.

Most investigations of non-chemical methods of mite control have looked at the use of predatory mites, primarily Persimilis (*Phytoseiulus persimilis*). Over 20 years of study by researchers throughout the world, results have been so mixed that few rose growers rely on this means of control today. These studies have suggested that relative humidity within the plant canopy and Persimilis dispersal in the greenhouse are two important factors in successful control. An additional complication is that pesticides applied for other arthropods and diseases can also harm Persimilis.

Changes in the past five years in how roses are produced, however, may have made the use of predatory mites feasible. In a new production method called *canopy bending* (discussed in Part I, Growing Points Summer, 1998 issue), the lower canes are bent parallel to the ground to expose more leaf area and increase the amount of photosynthesis. The dense canopy this creates raises the relative humidity in the lower portion of the plant (which is desirable for Persimilis) and provides “bridges” among adjacent plants for mites in search of prey. This dense canopy also makes it more difficult to contact twospotted spider mites with pesticides, which further supports the use of biological control.

Unlike many of the pesticides currently used for western flower thrips, the reduced risk pesticides being developed for thrips control do not affect predatory mites, thus removing another barrier to the integration of chemical and biological pest control methods for this pest. Studies will begin at UC Davis this fall to determine if biological control of twospotted spider mite can now be an effective tactic for rose growers.

Rose Powdery Mildew. Rose powdery mildew (*Sphaerotheca pannosa* var. *rosae*) is a fungal disease that is the other key pest of fresh cut roses. It can occur on both leaves and flowers, and the distortion it causes on the latter frequently reduces flower quality. It is currently controlled with fungicides, the most common being sulfur. Previous studies have suggested that sulfur is harmful to the predatory mites used to control twospotted spider mite, so methods of powdery mildew management that are compatible with arthropod biological control are needed if a comprehensive IPM program for roses is to be developed.

Toward that end, UC Davis plant pathologists will adapt a system to predict powdery mildew outbreaks on roses that is similar to the one currently used by grape producers. In this system, environmental conditions such as temperature and relative humidity that govern whether an epidemic will occur are regularly measured by automatic monitoring equipment. In grapes, this advance warning of conditions favorable to disease outbreak allows timely implementation of control measures. In the greenhouse, this early warning will allow environmental conditions to be manipulated to reduce the likelihood of this disease.

The potential restrictions imposed upon rose growers by the FQPA have created an opportunity to develop an IPM program for an important greenhouse crop in California. Hopefully, this work will provide the impetus for increased development and implementation of IPM programs throughout the greenhouse industry.

The authors gratefully acknowledge the generous financial support of the following organizations: Interregional Research Project 4, California Cut Flower Commission, California Association of Nurserymen, American Floral Endowment, University of California IPM Project, and USDA Western Regional IPM Program.

Postharvest Care of Cut Roses

By Michael Reid, Professor, Dept. of Environmental Horticulture, UC Davis

Consumers enjoy roses for their form, diverse colors, fragrance, and romantic associations. Unfortunately, for many consumers, the roses they buy do not perform as they should. The postharvest life of roses is affected by many factors, but four, in particular, require attention from producers and shippers if consumers are to be satisfied with their purchase. These four factors are:

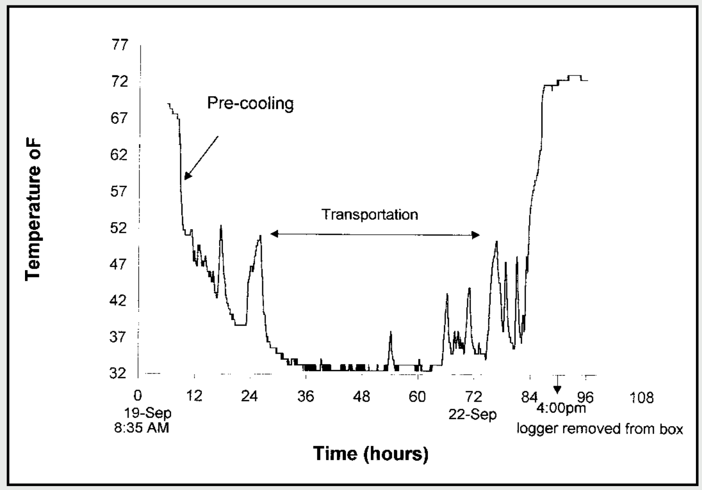
- Temperature
- Water relations
- Disease (*Botrytis*)
- Ethylene

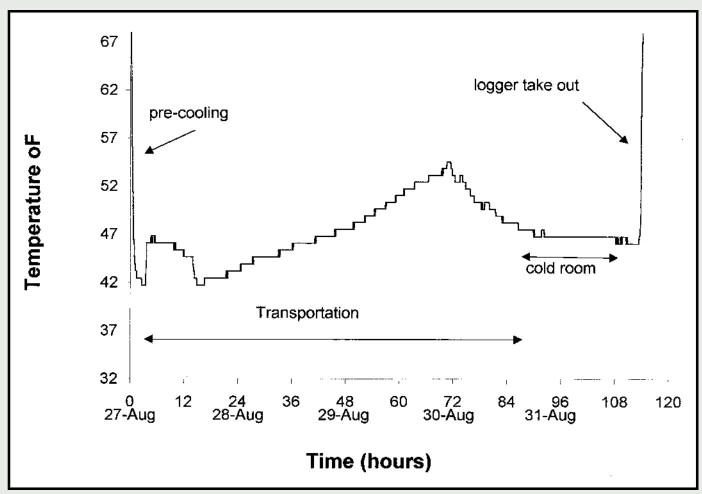
Temperature. We believe that temperature management is the most significant issue facing the cut rose producer and shipper. The correct temperature for the storage and shipping of cut roses is close to the freezing point: 33-34°F or 0.5 -1°C. Warmer temperatures increase the respiration of flowers, increasing their rate of development and aging, and reducing their eventual vase life. Roses held at 50°F —a temperature that is commonly recorded during transportation of California flowers—will deteriorate 3-4 times faster than roses held at 33°F. Our flowers, and particularly our roses, are being damaged during transport by our failure to precool them properly and by inadequate temperature control during transportation.

For this reason, we are monitoring the transport temperatures of cut flowers shipped from California by air and by truck. Recordings of temperatures during two different shipments of flowers from Watsonville to East Coast wholesalers are shown in Figure 1. In one case (Fig. 1a), the flowers were taken out of precooling at 50°F, and, thus, were not precooled effectively. Some increase in temperature accompanied transfer at the trucking depots in Salinas and Oxnard, but during the transportation period to an Ohio wholesaler, the flowers came down to the desired transport temperature. Several short increases in temperature at the end of the trip probably reflect drops at various wholesale operations in the Midwest.

In the other case, (Fig. 1b) precooling was more effective, bringing the flowers down to 42°F. But the temperature of the flowers increased steadily through the first half of the transportation period. At that time (probably when some flowers were dropped at an intermediate destination), the box was exposed to cool air in the truck, and the temperature fell slowly to 47°F. We would expect flowers in this box to have lost more than one third of their vase life during the transportation period. Such temperature records should be of great concern to all California growers and shippers.

As a means of providing more control over temperature, some growers put ice in the center of the flower box, and many use polystyrene caskets specifically for roses. Often the flowers in the caskets are not precooled, and the caskets may prevent forced air precooling (unless a hole is cut at each end of the casket). Our experiments show that putting ice in with the flowers helps some, but remember that it is the flowers we want to cool, not just the leaves and stems! There is no substitute for proper forced air precooling and transport in a properly refrigerated and carefully loaded truck.





Figures 1a (top) and 1b (bottom). *Temperature records from miniature dataloggers placed inside cartons of flowers during packing in Watsonville and retrieved at destinations in the Midwest.*

Water Relations. Wilting of flowers is the first and most common cause of shortened vase life in roses. This problem is the result of a complex interaction of events such as stress in the greenhouse at the time of harvest, excessive water loss during transport and storage, failure of stems to rehydrate, and growth of bacteria in the vase solution. Measures to reduce the likelihood of poor water relations include:

Figure 2 . *Effect of ethylene on 'Royalty' roses. Rose on the top was exposed to 1 ppm ethylene for 3 days.*

- Proper temperature management. Flowers should be cooled rapidly, and held cold throughout the distribution period. At low temperatures, water loss from the flowers is dramatically reduced
- Use of appropriate solutions and clean buckets. Roses should never be put in used solutions. Place freshly cut flowers in clean buckets containing an appropriate solution, either 50 ppm sodium hypochlorite (commercial bleach) prepared by putting 1 fluid ounce in 8 gallons of water (1 ml/liter), or a prepared solution of a commercial rehydration solution
- Use of a wetting agent (Agral) is recommended for flowers that will be held dry for a substantial period. Place the base of the bunched flowers for 10 minutes in a fresh solution containing 0.1% Agral. The detergent makes it easier for the base of the stems to be wetted when the flowers are placed back in water
- Recutting of the stems at destination and placing them in a rehydration solution (50 ppm hypochlorite, or a commercial rehydration solution).

Disease. Another serious cause of loss of cut roses is the growth of a fungus, *Botrytis cinerea* in the petals. This fungus is present in all greenhouses, and readily attacks petals whenever free moisture is present. Control of the fungus, which causes brown spots and then brown patches on the petals, depends on the following:

"As a result of ethylene exposure, red roses may fail to open properly."

- Preventing occurrence of free moisture on plants in the greenhouse. This requires careful management of the greenhouse environment to prevent saturated humidity, especially in the early evening when the greenhouse is closed and temperatures start to fall. Growers can reduce this risk by cracking the vents in the early evening when the heat first comes on.
- Cleanliness in the greenhouse. *Botrytis* is a fungus that grows best on dead and dying tissues. Fallen leaves, prunings, and petals in the greenhouse are an ideal substrate for the growth of *Botrytis* and the release of millions of spores from the velvety-grey patches that form when the infection is far enough advanced. You can never get rid of all *Botrytis* spores, but you can greatly reduce the risk of petal infection by reducing the number of spores on the petal.
- Temperature management. Whenever a cold petal comes into contact with warm air, condensation forms. Condensation on a petal allows *Botrytis* spores to germinate, and the fungus will rapidly colonize wounds in the petal, leading to infection. Moving cooled flowers to a warm packing shed, placing boxes of cooled flowers at room temperature, slow cooling of sleeved flowers, and excessive temperature variations in the cooler all result in condensation on petals, and should be avoided.
- Careful handling of flowers. As noted above, *Botrytis* typically colonizes petals through wounds in their surface, the waxy cuticle. The more damage on the outer petals, the more likely that *Botrytis* infection will occur. Careful handling of the flowers is therefore another way of reducing the likelihood of infection.

Ethylene. Most flower growers and shippers know that carnations are very sensitive to ethylene—a simple hydrocarbon gas emitted by motor vehicles and present in the environment in amounts toxic to carnations. Rose growers typically are unaware that some rose varieties are also sensitive to ethylene.

Ethylene effects can often be observed in supermarkets, where this gas is used to ripen bananas: Red roses may fail to open properly, opening in a 'star' fashion (see Fig. 2). Other rose varieties may open very rapidly, lose all their petals, or fail to open, altogether.

To further complicate the problem, storage temperature can exacerbate injury caused by ethylene. When roses are cool-stored, they often produce high levels of ethylene, causing a failure of some varieties to open after storage.

There are short-term and long-term ways of overcoming ethylene problems in cut roses. Among the important things to consider are:

- Do not store or display sensitive cultivars in ethylene-contaminated environments (distribution warehouses, supermarkets)
- Ventilate storage and display spaces (1 air exchange per hour with fresh air drawn from above the building) to remove contaminating ethylene
- Treat sensitive varieties with silver thiosulfate (STS), a material that is used to treat ethylene-sensitive cut flowers and potted plants
- Hold flowers at the proper storage temp. Ethylene has little effect when flowers are held at low temperatures
- Select non-sensitive varieties. Some roses are relatively insensitive to ethylene; a long-term approach to the ethylene problem is therefore the selection of ethylene-insensitive cultivars.

Conclusions. The observant reader will have noticed that control of temperature is a unifying thread in the suggestions above to reduce the effects of the major factors reducing the postharvest quality of cut roses. We believe that the importance of temperature cannot be overstated, and regard our work on improving the management of temperature during the marketing of cut flowers as the most important contribution that we can make to the California cut flower industry.

Are your cut roses dying of thirst?

Beautiful (and expensive) as they are, cut roses often are a disappointment in the home. Within a day or so, their necks are bent, heads are drooping, they fail to open and we throw them out. What's happening is that even though they are placed in a solution, our roses are dying of thirst. Air in the bottom of the stems, salts in the water, and bacteria infecting the base of the cut stem conspire to cut off the water supply to the flower and leaves.

Simple remedies can overcome this unfortunate situation. When you receive a bunch of cut roses, start by recutting them under water (removing about 2 inches) with sharp scissors or shears.

Now place the flowers in a clean vase (thoroughly clean with detergent and water), containing a vase solution, about 8" deep if possible. Use one of the following vase solutions:

1/4 teaspoon household bleach (like Clorox) in 1 quart of (preferably bottled) water (1/28 oz/quart)

or

Water from your swimming pool (if it's properly chlorinated)

When you put cut rose stems in water, bacteria grow quickly in the water. (That's why the water soon goes cloudy and starts to smell.) The chlorine in the household bleach or in the swimming pool water kills bacteria.

The above simple procedure will ensure that the flowers can take up water and will stay fresh. If you want them to open properly and have good color, they also need food. Many florists provide small packets of flower food which contains something to kill the bacteria that prevent water flow, and sugar, which is great food for flowers.

To get the very best out of your roses, recut them under water, then put them in a vase solution containing flower food such as:

Commercial flower food, properly mixed (use the right volume of water)

or

1 part of non-diet citrus soda (Sprite, 7-up, tonic water, etc.) plus 3 parts of water (preferably bottled water) and 1/4 tsp of bleach/quart of mixture,

or

1 part of non-diet citrus soda (Sprite, 7-up, tonic water, etc.) plus 3 parts of swimming pool water.

Like the flower food, citrus sodas contain sugar. They also contain citric acid, a substance found in lemons that keeps the water acid. When the water is acid, it moves better in cut flower stems. You still need the chlorine to keep bacteria from growing. (They love sugar, too.) *–Michael Reid*

News From the Ex(tension) Files

By Linda Dodge

Mr. F.A. writes: We have a problem controlling horsetail outdoors at our nursery. Repeated applications of RoundUp are not effective. It's driving us nuts. What's next?

Answer: Horsetail, known to botanists as *Equisetum arvense*, is a common weed throughout much of North America, Europe and Asia. It is an unusual plant in that it has survived almost unchanged since ancient times and was probably munched on by many a dinosaur. It does not produce flowers, but reproduces from spores like ferns do. It can also reproduce vegetatively from fragments of its extensive system of underground rhizomes.

Equisetum arvense produces two kinds of aboveground stems, one of which is fertile and bears a cone-like structure at the tip containing the reproductive spores. The spores require moist conditions over a long time period to germinate and develop, making vegetative reproduction more likely. The sterile shoots are bright green, appear jointed and have numerous feathery side branches, which account for the species common names of horsetail, scouring rush and bottlebrush. These stems have a high content of silica giving them a rough texture and die back to the ground each year.

Equisetum arvense is considered one of the world's worst weeds mostly because of its extensive underground system of branching rhizomes that spread horizontally and can descend to a depth of three feet in some soils. This makes it very persistent and able to develop into dense patches that compete with desirable plants and can even come up through asphalt.

The common name of horsetail is somewhat ironic, in that these plants can be toxic to horses and sheep and are considered a serious contaminant of hay. The fact that horsetail is being used as a medicinal herb for human consumption seems a bit ill-advised.

As far as control is concerned, persistent chemical application seems to be the only recourse. Cultivation seems to merely break up the rhizomes and scatter new plants over a greater area. Although herbicide recommendations are not within my miniscule realm of expertise, the research I have done indicates that multiple application of glyphosate (RoundUp) would have to be maintained over several growing seasons to be more effective. Some of the other chemicals used for horsetail control include dichlobenil, chlorsulfuron, and the ester or amine forms of 2,4-D, mecoprop and dichlorprop. Herbicides with a soil-sterilizing mode of action seem to be more successful at horsetail control.

At any rate, good luck in your control efforts or perhaps you could turn this lemon into lemonade and begin growing it for the medicinal herb market.

Notes From the Chair...

By Dave Burger

In August, the Department bid farewell and good luck to **Kathy Froman**, who served as receptionist in the main office for two years. She has returned to school at UC Davis to get her teaching credential. We'll miss you, Kathy!

We wish to welcome **Truman Young** to the official ranks of the Environmental Horticulture faculty. After serving as an affiliate scientist and lecturer with the Department since 1996, he has accepted the position of Assistant Professor and Restoration Ecologist here. For more information on his background and research, see the Growing Points Summer, 1997 Restoration Ecology issue.

Alison Berry, Associate Professor with the Department, has accepted the position of Program Director in the Division of Biological Sciences of the National Science Foundation. Located in the Washington, D.C. area, NSF is an independent U.S. government agency responsible for promoting science and engineering through programs that invest over $3.3 billion per year in almost 20,000 research and education projects.

After serving on several NSF grant panels, she was offered the one-year position in which she will administer a grant program and, hopefully, have input in policy activities as well.

She looks forward to acting as a liaison between NSF and the Davis campus and welcomes your thoughts and questions about NSF itself, or about issues of science and society. You may email her at: aberry@nsf.gov.

Dr. Svetlana Dobritsa, a senior scientist with the Institute of Biochemistry & Physiology of Microorganisms in the Moscow region of Russia, will oversee Alison's nodule development project and work with the *Frankia* organism for the coming year. Welcome, Dr. Dobritsa.

Another new face around EH is not really new. **Charley Hess**, an emeritus professor in the Department, has returned after a seven-year stint as Director of International Programs for the College of Agricultural and Environmental Sciences.

He is the former Dean of the College and served as Assistant Secretary for Science and Education in the USDA during the Bush Administration. When he returned from Washington, Dean John Kinsella asked him to start an International Programs office and serve as its first director. Charley retired in 1994 under the University's voluntary early retirement incentive program (VERIP 3), but was called back to continue serving as director of the International Programs office and to serve as a special assistant to the provost on a part-time basis. He retired as Director of International Programs on June 30, 1998, but continues as a special assistant to the provost.

Charley's role as a special assistant is to coordinate and facilitate the move of the USDA's Western Human Nutrition Research Center from the Presidio in San Francisco to the UC Davis Campus. He also is a liaison from the Chancellor's office to the International House for a project to construct an International Center adjacent to I-House on Russell Blvd. The proposed Center will house the new Vice Provost for Outreach and International Programs and other international programs and activities on campus.

The **California Association of Nurserymen** has generously awarded scholarships to three students here at EH for 1998/99. Congratulations to recipients **Colleen (Bear) McGuinness**, **Jonas Moe** and **Loren Oki**.

In addition, graduate students **Carmen Garcia-Navarro**, **Soo Kim** and **Rosa Valle** each received a *John & Terry Kubota Scholarship* for the coming school year.

Yoneo John Kubota, whose research interests included flower crop production in greenhouses, retired from the Department in 1984 after a 32-year career as a staff research associate. Following his retirement, he surprised the department by revealing that he had established a scholarship "in recognition of the encouragement scholarships can provide to outstanding students." It was his aim to "serve the University and its students." John worked with **Professor Tony Kofranek**, now also retired.

Seymour Gold, Professor of Environmental Planning with the Department, recently was selected *Citizen of the Year* by the American Society of Safety Engineers, Sacramento Chapter. The award commended his extensive recreation safety research and his contributions in drafting the 1990 Playground Safety Legislation for California.

Congratulations, also, to **Jim MacDonald**, chair of the Plant Pathology Dept., who received the 1998 *Media Award of Excellence* from the National Association of Colleges and Teachers of Agriculture. He was presented the award for his instructional compact disc, *Turfgrass Diseases: Diagnosis and Management.* Jim has a courtesy appointment with the Department.

Where are they????

While working as an Alameda County farm advisor specializing in ornamental greenhouse nursery production, **Kathy Hesketh** continued to attend classes. In 1984, she earned her MS degree with Richard Harris. She then worked for Grace Sierra, a control-release fertilizer company, in northern California and Australia. Currently, she is Northern California Sales Representative for Pace International, a foliar nutrient company based in Kirkland, Washington.

Tina Huffman (formerly Tina Flint) is Webmaster for the marketing department at Aquatrols Corp.--a specialty chemical manufacturing company serving the greenhouse/nursery and professional turf industries in Cherry Hill, New Jersey. She also provides product service for their greenhouse and nursery customers.

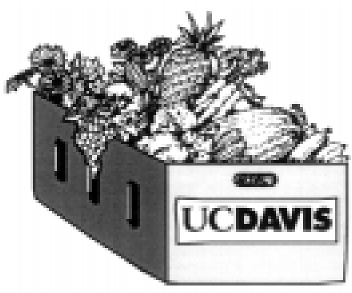
Tina received her BS degree here in Nursery Production and Management (an independent major) in 1995. Her company's Web site is at www.aquatrols.com.

Mike Henry is keeping busy with several projects during his six-month sabbatical in the Department.

While here, he is working with Glen Forister and Heiner Lieth to set up a central Website for Cooperative Extension's Master Gardener programs, statewide. This project is funded by the Elvenia Slosson Endowment.

He also is writing a field guide that will assist landscape professionals with the mathematical calculations necessary for irrigation scheduling and water, fertilizer and pesticide requirements. In his spare time, he works on his Web page.

A turf and landscape horticulture advisor for Riverside and Orange Counties, Mike earned his MS degree here with Jack Paul in 1973.



Postharvest Outreach Program

http://postharvest.ucdavis.edu

Located on the UC Davis campus, the Postharvest Outreach Program has a 20-year history of providing educational and informational services to members of industry, the general public and governmental agencies. Through a variety of resources, its goal has been to

- improve the quality and value of horticultural crops available to the consumer
- reduce postharvest losses and improve marketing efficiency
- focus on solving particular problems in handling fruits, vegetables and ornamentals.

According to the program's director, CE Specialist Jim Thompson, of the Biological and Ag Engineering Dept. at UCD, one of the program's most popular offerings has been the yearly two-week short course on postharvest technology of horticultural crops. "It was a bit slow getting started," Jim says, "but now it is well attended by applicants from around the world."

The program also offers 1- to 3-day workshops in various locations throughout the state on topics such as management of fruit ripening, maintaining quality and safety of fresh cut products, and postharvest handling of fruits, nuts, vegetables, and ornamentals.

Among other resources offered by the program's 13 extension specialists are industry meetings and individual consultations for extending information about postharvest handling. In addition, a quarterly newsletter--*Perishables Handling*--reports research in progress and offers reviews of various aspects of postharvest technology for horticultural crops.

To learn about other resources offered by the Postharvest Outreach Program, view their website or call them at (530)752-6941.

Subscription Information

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