GROWING Points

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UC Master Gardeners on the Front Lines of Urban Pesticide Runoff Outreach Efforts

by Linda Dodge

The anticipated phase-out of the insecticides diazinon and chlorpyrifos will leave California homeowners and gardeners short of easy ammunition in the war against the arthropods (bugs, that is) and their allies. Substantial use of these chemicals has caused contamination of urban waterways and makes water quality agencies leery of what materials may replace them. Many regional and county water control boards and sanitary districts have partnered with UC Master Gardeners and the UC Statewide Integrated Pest Management Project to inform the public about the less-toxic alternatives of integrated pest management (IPM) for controlling home and garden pests. This logical use of UC Master Gardeners to spread the IPM message to the general public demonstrates the value of this organization for Cooperative Extension outreach.

Clean Water Act Mandates TMDL Process

Since the mid-1990s, stricter enforcement of the Federal Clean Water Act in California has mandated that communities identify water bodies "impaired" of their normal uses by the occurrence of pollutants in the form of sediment, pathogens, heavy metals, nutrients and/or hazardous chemicals. Monitoring programs have been established by regional water quality control boards to determine the types and quantities of pollutants affecting individual waterways. The "Total Maximum Daily Load" (TMDL) concept has been adopted to determine the levels of pollutants a water body could be exposed to without impairing its normal uses.

Point-of-purchase display with consumer IPM information as part of Sacramento's "Water Wise Pest Control" program.

During the process of monitoring creeks and streams in many urban areas, the chemical insecticides diazinon and chlorpyrifos have been found at concentrations toxic to aquatic invertebrates such as the water flea (*Ceriodaphnia dubia*). Because these organisms are essential to the freshwater aquatic food chain, many urban waterways have been declared "impaired" due to the presence of these pesticides. Water quality agencies are, therefore, mandated to develop programs for reducing the levels of these chemicals and establishing TMDL standards for individual creeks and streams that drain from urban areas.

Meanwhile, at the EPA…

During this same time, the Food Quality Protection Act of 1996 mandated that the EPA reexamine the registration of many pesticides in light of mounting scientific evidence showing these chemicals to be more harmful to humans and other non-target organisms than previously thought. Two candidates for this process, the organophosphate compounds diazinon and chlorpyrifos, were found to be hazardous enough to warrant the complete phase-out of their uses as homeowner insecticide products and significant reduction of agricultural uses.

Diazinon is a broad-spectrum insecticide acting on the nervous system of target pests. Six million pounds are applied annually in the United States, 39% by homeowners to kill indoor, garden and lawn pests. Products containing diazinon account for 30% of the homeowner use insecticide market. One granule of the common broadcast formulation of diazinon is toxic enough to kill a small bird and half of the reported bird kill incidents have resulted from residential use. Diazinon is one of the most commonly found pesticides in air, rain and fog, and is often detected in surface water runoff from urban areas. The agreement between manufacturers of diazinon and the EPA calls for indoor uses to be phased out by the end of 2002 and outdoor uses to end by 2003.

Chlorpyrifos has a mode of action simi-

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In This Issue...

Topics in Restoration Ecology

Restoration ecology has developed as a discipline since the 1970s. The Society for Ecological Restoration (SER) (www.ser.org), founded in 1988 and headquartered in Arizona, facilitates communication and collaboration among the growing number of practitioners, academics and stakeholders involved in restoration projects around the world. SER's definition of the discipline is: "Ecological restoration is the process of assisting the recovery and management of ecological integrity. Ecological integrity includes a critical range of variability in biodiversity, ecological processes and structures, regional and historical context, and sustainable cultural practices." The following article, adapted and reprinted with permission from the Spring 2001 issue of "Noxious Times" (the quarterly newsletter of the California Interagency Noxious Weed Coordinating Committee) (http://pi.cdfa.ca.gov/noxioustimes/), explores several aspects of defining native plants, essential components of restoration projects.

What is a Native Plant?

By Truman Young, Associate Professor and Restoration Ecologist
Dept. of Environmental Horticulture, UC Davis

An essential element of restoration projects is the encouragement of native species. This is not merely because natives "do better" (survive without maintenance), but because the goal of most restoration projects is to return the site to as natural a condition as possible. So what is a native plant? The answer may seem simple, but it has temporal, geographical and taxonomic/genetic elements.

Time: Although Native Americans moved plants around both intentionally and otherwise, most restoration ecologists (in the Western Hemisphere at least!) are satisfied with setting a time limit of 1500. Types that were here before Columbus are “native”. That is as far as most definitions go, but we still need to clarify “here” and “types”, and assume that we can reliably determine the status of plants 500 years ago (no simple task in some highly disturbed California landscapes).

Geography: In horticulture, the limits of native species are often state lines, but restoration requires a much more restrictive meaning. Plants should be taken from as near the restoration site as possible, usually within a few miles. Geographic definitions merge with taxonomic ones, below.

Taxonomy: Gone are the days when suppliers can say, “Well, the *genus* is native.” However, we still see cases of Saskatchewan grasses being peddled in San Diego. At the very least, plants used in restoration should be of the lowest known taxonomic level (this is often not merely species, but subspecies or variety). Even finer genetic matching is preferable. The U.S. Forest Service divides California into dozens of “seed zones” and tries not to move material between them. In Yosemite, restorationists try to bring material from the same local catchment. The ideal is to harvest seed or plant material at the site itself, either prior to disturbance, or among the survivors.

Genetic pollution from non-native ecotypes of native plants has the potential to be almost as damaging as noxious weeds to the natural heritage of California, and it would be a shame if the restorationists are part of the problem instead of part of the solution. The theme underlying all of this: “Is it likely that this genotype would have gotten here without human activity?”

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lar to diazinon and, of the 20 million pounds applied annually in the U.S., 52% is used by residents and pest control professionals in and around homes, schools and public buildings. Chlorpyrifos is highly toxic to fish and other aquatic organisms and is frequently found in urban streams resulting from residential runoff. Manufacturers have agreed with the EPA to phase out home lawn and outdoor uses by the end of 2001, and different uses against termites by 2005.

IPM is the Message and UC Master Gardeners are the Messengers

The converging regulatory realities of impaired water bodies and EPA phase-outs have led many local agencies to seek alternatives to residential uses of diazinon and chlorpyrifos. Many of the remaining chemical insecticides available to homeowners are potentially as toxic to non-target organisms if not more so. Synthetic pyrethroids, for example, are more potent formulations of the natural pyrethrin derived from chrysanthemum, and are as toxic to some aquatic organisms as the organophosphate pesticides. Rather than just recommend other chemicals to replace the phased out materials, regional and county programs have been developed to encourage the principals of integrated pest management (IPM) and less-toxic methods for controlling home and garden pests. Because IPM is a multifaceted approach to pest control involving preventive measures, the use of biological control agents (beneficial insects) and more precise application of chemicals, the educational outreach component of these programs is significant. Many agencies have turned to experts in the UC Statewide IPM Project and Cooperative Extension’s Master Gardener Program to develop and deliver the IPM outreach message.

Working with Master Gardener Coordinators in various counties and Mary Lou Flint and Cheryl Reynolds of the UC Statewide IPM Project, agencies have trained Master Gardener volunteers to make presentations in a variety of public venues on the problems of urban pesticide runoff and the principles of IPM for controlling pests in and around the home. Several programs have also produced written materials for consumers on how to manage specific pests

through IPM which have been distributed at events and at cooperating garden centers and hardware stores. Some of the successful programs include the "Our Water, Our World" campaign developed by the Regional IPM Partnership of various agencies in the eight counties of the San Francisco Bay Area (www.basmaa.org), the Central Contra Costa Sanitary District's "Less-Toxic Home and Garden Guide" (www.centralsan.org) and the Sacramento Stormwater Management Program's "Water Wise Pest Control" project (www.sacstormwater.org). Master Gardener volunteers presented program information to the public at workshops, farmers' markets, county fairs and garden shows. Nearly 70% of the attendees at one workshop event said they would change their pest management strategies as a result of the information presented.

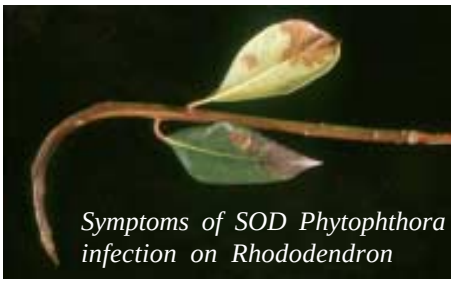
Urban Horticulture Workgroup Coordinates Statewide Efforts

The Urban Horticulture Workgroup is a newly-formed association of Cooperative Extension advisors and specialists and campus academics with common interests in issues related to horticulture in urban environments. Supported by UC's Division of Agriculture and Natural Resources and chaired by Pam Geisel (UCCE Fresno County), the purpose of this group is to foster statewide communication and collaboration among its members. The Master Gardener program is one of the group's responsibilities and was the focus of a recent statewide workgroup meeting.

Several members involved in local pesticide pollution prevention campaigns shared their experiences with setting up Master Gardener training programs and developing IPM information for homeowners. The goal of the session was to combine the best methods into a statewide outreach effort to educate the public about water quality, urban pesticide runoff and IPM alternatives. They plan to develop consumer information cards on IPM methods for specific pests, web-based water quality information as part of the UC IPM website (www.ipm.ucdavis.edu) and outreach programs with statewide organizations such as the California Association of Nurserymen. These efforts will undoubtedly be successful in bringing about awareness of the problem and of IPM alternatives for California homeowners. GP

New Hosts Found for Sudden Oak Death Pathogen

Since 1995, a mysterious disease coupled with secondary insect attack, has killed thousands of native oaks in several coastal counties of California. Tanoak (*Lithocarpus densiflorus*), coast live oak (*Quercus agrifolia*) and black oak (*Quercus kelloggii*) continue to die in alarming numbers and UC researchers have identified a previously unknown strain of *Phytophthora* as the main causal agent of what has become known as "Sudden Oak Death" (SOD). Unlike related soil-borne strains, this pathogenic fungus attacks the trunk and branches of susceptible trees causing the formation of bleeding cankers and predisposing them to attack by bark beetles. Mature trees can die in as little as six to eight weeks.



Symptoms of SOD Phytophthora infection on Rhododendron

As researchers and foresters race to halt the spread of this highly contagious pathogen, the question of where it came from may be a key factor in developing a control program. Is this a native fungus that became pathogenic due to environmental change or an exotic strain introduced from elsewhere to which our native trees have no immunity?

During the summer of 2000, Dr. Clive Brasier, an expert on *Phytophthora* diseases of forest trees from the Forestry Commission in the UK, viewed the new strain in the laboratory of plant pathologist Dr. Matteo Garbelotto at UC Berkeley. Dr. Brasier later recognized the same pathogen isolated from ornamental rhododendrons in Germany and the Netherlands. This *Phythophthora* began appearing on European rhododendrons in 1993 but has not been found on European oaks.

Because ornamental rhododendrons are bought and sold around the world, the knowledge that this genus is a host for the new *Phytophthora* pathogen establishes a means of transporting the disease over long distances. In January 2001, UC Davis plant pathologist Dr. David Rizzo and UC Cooperative Extension farm advisor Steve Tjosvold found the same pathogen on rhododendrons from a Santa Cruz County nursery. Researchers have not established whether the pathogen was transmitted from Europe to California or originated in California and spread to Europe or was transported to both places from an unknown origin.

Researchers are currently sampling other species of plants to establish the host range of the SOD *Phytophthora* strain in California. It has been isolated from a fourth oak species, Shreve oak (*Quercus parvula* var. *shrevei*), in Santa Cruz County and trees of this species occurring in coastal areas of southern Sonoma County south through Santa Barbara County are considered at risk. A common component of coastal forests, the bay laurel (*Umbellularia californica*) has also been attacked by the SOD pathogen at several locations. The fungus causes lesions on leaf tips but has not yet been isolated from branches or trunks.

Two species in the same botanical family as rhododendron (Ericaceae) have been established as additional SOD pathogen hosts. *Phytophthora* has been recovered from leaf spots and cankers on small branches of madrone (*Arbutus menziesii*) at several locations. Dieback of these trees has been observed in SOD-infected areas. Even more alarming is the occurrence of the fungus on native evergreen huckleberry (*Vaccinium ovatum*) at Muir Woods and Mt. Tamalpais. The susceptibility of this species poses a threat to the commercial blueberry and cranberry industries. Oregon and Canada have imposed quarantines prohibiting the import of nursery stock or wood products of all oaks, tanoak, rhododendron and evergreen huckleberry from California.

The California Oak Mortality Task Force (www.suddenoakdeath.org) has been established to coordinate the efforts of public agencies, non-profit organizations and private interests in implementing research, education, management and public policy addressing the issue of Sudden Oak Death. The public can access the website for information on managing trees on their property. They can also participate in the SOD distribution mapping project by submitting data on diseased trees.

-Linda Dodge

UC Horticulture Research Projects Funded for 2001-2002 by the Elvenia J. Slosson Endowment *by Linda Dodge*

Elvenia J. Slosson spent most of her life as an advocate of landscape beautification. She founded and served as the first president of the California Garden Clubs. The Elvenia J. Slosson Research Endowment was created in 1970 from a gift she left the University of California "for the advancement and promotion of the science and practice of horticulture". The Endowment has supported many worthy projects since that time and those funded for the 2001-2002 fiscal year are no exception. The thirteen proposals chosen for support by the Slosson Research Endowment address diverse current issues in California horticulture in the areas of plant culture, soils and irrigation, pest management, public gardens and public education.

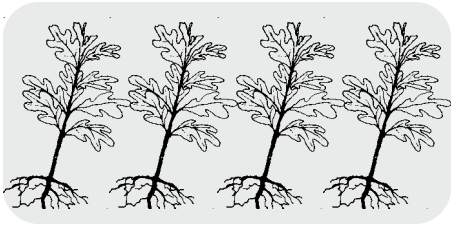
Plant Culture

"Testing of Kohl Lilies for Suitability as Garden Plants" is a project led by Deborah Giraud of UCCE Humboldt County. The garden performance of numerous varieties of *Lilium longiflorum* developed by Harry Kohl at UC Davis and Richard Merritt at Rutgers will be evaluated. These varieties have been bred for short stature and profuse flowering in contrast to the tall Oriental lilies. Because the Kohl varieties can produce sizable flowering plants from small bulbs or bulblets, they will be tested for production as bedding plants including consumer preference surveys at local nurseries.

Larry Costello of UCCE San Mateo/ San Francisco Counties and Doug McCreary of the UC Integrated Hardwood and Range Management Program are collaborating on "Assessing the Influence of Irrigation and Treeshelters on the Root Development of Three California Native Oak Species". Establishment of California native oaks for revegetation and landscape purposes has been studied extensively over the last twenty years with an emphasis on practices that enhance top growth. This study seeks to establish the effects of irrigation levels and the use of treeshelters on the root system size and distribution of container stock and direct-seeded acorn stock of blue oak (*Quercus douglasii*), valley oak (*Q. lobata*) and coast live oak (*Q. agrifolia*). The trees have been growing for three years at the Bay Area Research and Extension Center in Santa Clara and will be excavated in this final year of the project using a pneumatic tool that blows soil away from the root systems leaving them exposed but intact. The results of this study will refine procedures for the successful establishment of oaks in the landscape.

"Root Growth of Direct-seeded and Container-grown Valley Oak in Irrigated and Nonirrigated Soil", led by Truman Young and Richard Evans of the Environmental Horticulture Department at UC Davis, examines the method of establishment of trees in the landscape on their eventual performance under xeriscape conditions. In this third and final year of the study, the pneumatic excavation technique will be used to compare root systems of valley oak trees that were seed sown or transplanted from container stock and not irrigated during the two years of establishment or irrigated with drip or overhead sprinkler systems during establishment. The effects of these treatments on root architecture during the third year with only natural rainfall may resolve the conflicting goals of rapid growth and drought tolerance for establishment of oaks in xeriscape situations.

Ellen Zagory of the Davis Arboretum will lead a group of distinguished horticulturists in the project "Cutting Stock Manipulation to Enhance Rootability of Superior Forms of Oaks for Western Gardens". The collection of oaks native to the western US and Mexico on the grounds of the Davis Arboretum is widely recognized and has been nominated as the western repository for oaks within the North American Plant Collections Consortium. Within the collection are individual trees showing superior characteristics such as small size, columnar form and heat and drought tolerance that make them desirable sources of clonal propagation material. These individuals are now more than 30 years old and therefore difficult to root by stem cuttings. This project will involve using watersprouts from selected individuals as



cutting material, establishing stock blocks hedged to promote rootability and determining optimum rooting conditions to ultimately make available improved selections of oaks for landscape use.

Soils and Irrigation

"Measuring the Impact of Building Development on Physical and Chemical Properties of Landscape Soils" is a project led by Larry Costello of UCCE San Mateo/ San Francisco Counties and Richard Harris, emeritus professor in the Environmental Horticulture Department at UC Davis. The building construction process is often blamed for subsequent adverse landscape soil conditions, including compaction, pH effects and salt content. These researchers plan to evaluate physical and chemical properties of landscape soils in a one-year-old housing development where plants are performing poorly and in a nearby development that is currently under construction. Nearby fields will also be sampled to establish pre-construction soil conditions. This information will be useful for mitigating the impact of building development on landscape soils.

Jim Downer of UCCE Ventura County will study the "Suitability of Commercially Available Potting Media for Home Use". Many companies offer manufactured potting media for home container gardening and, although the ingredients are listed, some components (including the recent introduction of composted yard waste) may have adverse effects on plant

growth. The goals of this project are to assess the chemical characteristics (pH, salinity, phytotoxic compounds) of numerous commercially available potting media and to determine their effects on the growth of several plants species. The media will be sampled every three months over the course of a year to ascertain how their chemical characteristics change over time.

Lin Wu of the Environmental Horticulture Department at UC Davis will complete his three-year study of "Landscape Plants for Recycled Water Irrigation in California Landscapes and Gardens". Although recycled water usually has elevated levels of sodium chloride and other salts, its use for landscape irrigation has become unavoidable in many California cities. This project will focus on determining the salt tolerance of California native perennial bunchgrasses with potential for use in the landscape and of selected groundcover, tree and shrub species not studied in the previous two years. Both greenhouse and field experiments will be conducted to determine the mechanisms of salt sensitivity or tolerance for individual species, considering uptake of salt into plant tissues and also the incidence of salt-laden water on plant surfaces due to sprinkler irrigation.

Pest Management

Ole Becker of the Nematology Department at UC Riverside, Cheryl Wilen of UCCE San Diego County and Jim Downer of UCCE Ventura County are collaborating on the project "Root-knot Nematode-destroying Microorganisms for Home Garden and Landscape Use". Root-knot nematodes are significant pests of a wide range of plants in California and their infestations in plant root systems cause malnutrition, chlorosis, stunting and susceptibility to other pathogens. Chemical soil treatments against nematodes are no longer available for home gardeners in California so the development of a biological control agent would be desirable. Numerous strains of fungi have been isolated from naturally occurring nematode-suppressive soils. This project will evaluate these fungi for their efficacy in controlling root-knot nematode populations in greenhouse experiments. The most effective strains will be tested further to determine the best carrier and application methods and subsequently tested in landscape soils naturally infested with root-knot nematodes.

"Interactions of Tactics for Management of Eucalyptus Insect Pests" is a project to be led by Timothy Paine and Jocelyn Millar of the Entomology Department at UC Riverside. Eucalyptus trees have been part of the California landscape for the last 150 years but, since 1984, an average of one new insect pest per year has become established here from their native Australia causing damage on a massive scale. UC researchers have been key players in identifying and controlling individual pest species as they have been introduced and are now finding it necessary to examine them as a complex of pests including borers, sap feeders and defoliators. Management recommendations for one species may exacerbate problems associated with another. For example, watering and fertilizing to enhance tree vigor and resistance to the eucalyptus longhorned borer may increase susceptibility to the red gum lerp psyllid and eucalyptus tortoise beetle. By examining interactions among the current pest management strategies, these researchers hope to develop recommendations for controlling the entire complex of eucalyptus pests to below damaging levels.

Public Gardens

Brett Hall of the UC Santa Cruz Arboretum will lead the project "Master Planning a California Native Horticultural Teaching Garden at the UCSC Arboretum". This garden's commitment to the conservation and introduction of plants through sound horticultural practices and education is well known and this project will focus on native plants from the Central California Coast Range. The teaching garden will serve as the foundation for academic and public education programs pertaining to rare and endangered species, maritime chaparral, Central Coast native bulbs, plants for specific landscape niches, habitat restoration and plant community landscape design.

"A Demonstration Garden of California Native Plants along the Mariposa Creek Parkway" is a project headed by Wain Johnson of UCCE Mariposa County that brings together several county agencies and volunteer organizations. They plan to develop a garden in the foothill town of Mariposa featuring regional native plants that are aesthetically pleasing, drought tolerant, attractive to birds and/or butterflies, unattractive to deer and resistant to fire. The garden will be free to the public, labeled for self-guidance and accessible to the handicapped. It will provide a valuable teaching resource for horticulture students and the general public.

Public Education

Mary Lou Flint and Joyce Strand of the UC Statewide IPM Project will lead the development of "Interactive Tools for Growing and Maintaining Healthy Lawns". Lawns occupy much of the urban/suburban landscape and are usually managed intensively, using up to 60% of urban water and receiving the majority of pesticides and fertilizers applied to urban plantings. As water use is curtailed and declining water quality is blamed on chemicals found in urban runoff, the need for comprehensive guidelines on better turf management is obvious. The goal of this project is to develop computerized, interactive learning tools that will provide the user with lawn management options tailored to his or her specific site. The learning modules will be accessible on the World Wide Web or on CD-ROM and will provide information on lawn irrigation, fertilization and management of insects, diseases and weeds. Least toxic, environmentally sound practices will be emphasized for maintaining healthy lawns with reduced use of water and chemicals.

In its second year of funding by the Slosson Endowment, "Educating Home Gardeners: Building on the Garden Information Center Model" led by Rachel Mabie of UCCE Los Angeles County will continue to provide UC research-based gardening information to home gardeners through printed brochures available from displays at local nurseries. Five brochures on individual gardening topics will be added to the fifteen already produced based on feedback from nurseries participating in the pilot project. Industry partnerships will be explored to make the Garden Information Center self-supporting and selected brochures will be translated into Spanish and other languages.

These diverse research projects will provide useful information and resources for gardeners and horticulturists in the near future. Follow their progress on the Slosson website:

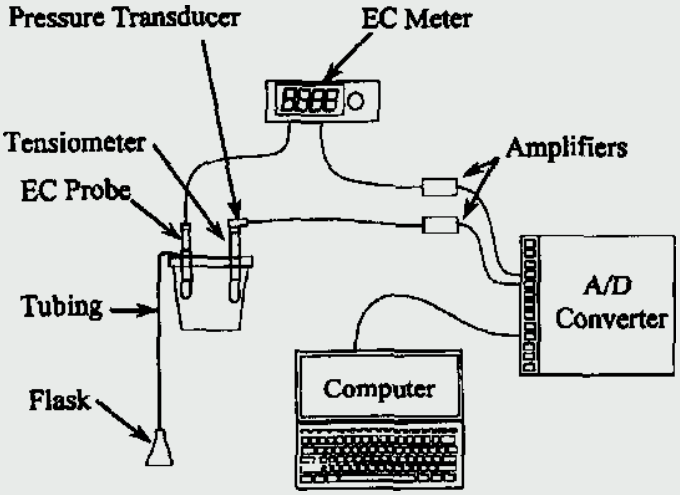
http://slosson.ucdavis.edu GP

New EH Faculty Publications Emphasize Global Collaboration

A quick perusal of the recent scientific literature reveals several new contributions by faculty and affiliates of the Environmental Horticulture Department at UC Davis. A recurring theme within this group of publications is collaboration with colleagues from academic institutions around the world. The issues addressed in these research efforts emphasize the common interests of horticulturists in North America, Europe, Africa, Asia and Australia.

Anekonda, T.S., Adams, W.T., Aitken, S.N., Neale, D.B., Jermstad, K.D. and Wheeler, N.C. 2000. Genetics of cold hardiness in a cloned full-sib family of coastal Douglas-fir. *Can J. For. Res.* 30: 837-840.

Dr. David Neale and Kathleen Jermstad of the Institute of Forest Genetics collaborated with researchers from Oregon, Washington and British Columbia to investigate the genetics of cold-hardiness in the important timber tree, Douglas-fir. They used clonal material from the third generation of controlled crosses to evaluate cold injury to needle, stem and bud tissues after artificial freeze testing. More variation was seen among clones than had been previously found among open-pollinated families suggesting that improving cold-hardiness by within-family selection is promising. They also compared seasonal cold-hardiness and found that many of the same genes controlled hardiness of different tissues within the same season, but genetic control was stronger in the spring and independent of fall cold-hardiness. They plan to use the technique of quantitative trait loci (QTL) mapping to confirm these findings.



Setup of equipment (from Eymar et al. 2001) to continuously measure and record EC and container medium moisture tension.

Macnish, A.J., Joyce, D.C., Hofman, P.J., Simons, D.H. and Reid, M.S. 2000. 1-Methylcyclopropene treatment efficacy in preventing ethylene perception in banana fruit and grevillea and waxflower flowers. *Austral. J. Exp. Agric.* 40 (3): 471-481.

Dr. Michael Reid teamed up with researchers at the University of Queensland, the Queensland Horticultural Institute and long-time colleague, Dr. Daryl Joyce (now the leader of the Postharvest and Food Technology Group at Cranfield University in the U.K.), to test the new anti-ethylene treatment, 1-MCP, on the ethylene-sensitive commodities banana, grevillea and Geraldton waxflower. Bananas treated with 10 ppm 1-MCP at 20°C were protected against ethylene for 13 days but ten times as much 1-MCP was necessary at 2.5°C to achieve the same protection. Grevillea and waxflower treated with 10 ppm 1-MCP at 20°C regained sensitivity to ethylene after only two days. In contrast, waxflower treated with the former industry standard, silverthiosulfate (STS), were protected for 10 days.

Nalin, R., Putra, S.R., Domenach, A-M., Rohmer, M., Gourbiere, F. and Berry, A.M. 2000. High hopanoid/total lipids ratio in *Frankia* mycelia is not related to the nitrogen status. *Microbiology* 146: 3013-3019.

Dr. Alison Berry worked with colleagues at the Université Lyon and the Université Louis Pasteur in France on this investigation of the types of lipids found in the nitrogen-fixing symbiotic actinomycete, *Frankia*, grown on media with different levels of nitrogen. Under nitrogen-limiting conditions, *Frankia* forms vesicles containing hopanoids, lipids which are believed to protect the nitrogen-fixing enzymes. These researchers identified four hopanoids, including two previously unknown in *Frankia*. The hopanoid content varied only slightly between strains grown under high nitrogen conditions and those grown under nitrogen-depleted conditions. This suggests that these lipids are remobilized from other cells during vescicle formation rather than newly synthesized.

Eymar, E., Oki, L.R. and Lieth, J.H. 2001. Continuous measurements of electrical conductivity in growing media using a modified suction probe: Initial calibration and potential usefulness. *Plant and Soil* 230: 67-75.

Dr. Heiner Lieth and doctoral student, Loren Oki, collaborated with Enrique Eymar of the Universidad Autónoma de Madrid in Spain for the development of a device to nondestructively measure the electrical conductivity (EC) in container growing media. The monitoring of EC in media during growth of ornamental container crops is important as an indicator of nutrient status and to determine the need to leach salts from the root zone. Conventional methods for measuring EC involve collecting a media sample, extracting the liquid from it, putting the liquid in contact with a conductivity cell and recording the level of conductivity. The device developed by these researchers uses the ceramic cup of a high-flow tensiometer and an EC cell combined into a probe that can

be placed in a pot containing a growing plant. A pressure head forces the medium solution into the probe and past the EC cell. The conductivity is recorded periodically on a computer connected to the EC meter (see diagram). The system was calibrated against the conventional method of EC measurement to determine the correct pressure head to use. This system for continuous EC measurement is nondestructive and can reveal how nutrients added during fertigation interact with the container medium, the rate at which plants take up water and nutrients and when nutrients begin to accumulate in the root zone. Readings could be integrated with irrigation controllers and fertilizer injectors to automate fertigation management.

Pedroso, M.C. and Durzan, D.J. 2000. Effect of different gravity environments on DNA fragmentation and cell death in *Kalanchoë* leaves. *Annals of Botany*. 86(5): 983-994.

Dr. Don Durzan worked with Maria Pedroso of the University of Lisbon in Portugal to study the effects of different levels of gravity on the succulent species mother-of-thousands (*Kalanchoë daigremontiana*) at the tissue and cellular levels. They used special staining techniques to visualize DNA fragmentation and specific chemical formation in cells. Apoptosis, or programmed cell death, in leaves was more common as gravity increased. The stress of increased gravity led to a burst of nitrous oxide formation in chloroplasts. This free radical triggered a sequence of events in some cells resulting in chloroplast DNA damage and degeneration, followed by nuclear degeneration and cell death by apoptosis.

Waithaka, K., Dodge, L.L. and Reid, M.S. 2001. Carbohydrate traffic during opening of gladiolus florets. *Journal of Horticultural Science and Biotechnology* 76 (1): 120-124.

Dr. Michael Reid hosted Kimani Waithaka of the University of Nairobi in Kenya during his stay in the EH Department. One of several research projects they worked on involved examining patterns of carbohydrate distribution during opening of gladiolus florets. The principal soluble carbohydrate in florets was fructose with small amounts of glucose, sucrose and starch. Removal of florets from the base of the spike reduced the dry weight of the upper buds as they opened suggesting remobilization of carbohydrate from the lower florets as they senesced to the still-developing upper florets.

Okello, B.D., O'Connor, T.G. and Young, T.P. 2001. Growth, biomass estimates and charcoal production of *Acacia drepanolobium* in Laikipia, Kenya. *Forest Ecology and Management* 142: 143-153.

Dr. Truman Young collaborated with colleagues from the University of Natal in South Africa on this study of sustainable charcoal production at the Mpala Research Center in Kenya. Over 75% of Kenyans use wood in the form of charcoal or firewood as a source of cooking energy. This has led to a massive depletion of woody vegetation which could result in loss of most of the country's indigenous forests by the year 2040. These researchers investigated the potential of the native whistling thorn tree (*Acacia drepanolobium*) as a source of sustainable wood production for making charcoal. This species occurs in dense stands covering large areas, coppices readily after being cut or top-killed by fire, has hard wood for making high quality charcoal and is of low forage value to wildlife due to the presence of ants colonizing thorns along the trunk. Predictive models and chrono-sequence analysis were used to determine that stands of whistling thorn trees could produce enough biomass on a 14-year cycle of production for sustainable yields of charcoal.

Jo, H.-K. and McPherson, E.G. 2001. Indirect carbon reduction by residential vegetation and planting strategies in Chicago, USA. *Journal of Environmental Management* 61: 165-177.

Dr. Greg McPherson of the Western Center for Urban Forest Research and Education worked with Hyun Kil Jo of Kangwon National University in South Korea to quantify the effects of residential vegetation on reducing home heating and cooling demands thereby reducing carbon emissions from power plants. Currently, the concentration of carbon dioxide in the atmosphere is increasing by 4% every decade and, if this trend continues, could exceed preindustrial levels and cause climate change within the next 50 to 100 years. Urban vegetation is known to reduce heating needs in cold weather by lowering windspeed and decreasing infiltration of cold air into buildings. During warm weather, urban vegetation blocks solar radiation thereby reducing cooling needs and creates cool microclimates near buildings due to evapotranspiration. These researchers used computer modeling to predict decreased carbon emissions of from 3.2% to 3.9% per year due to shading, evapotranspiration and wind-reduction effects of current vegetation patterns in Chicago neighborhoods. GP

EH Department News

Dr. Alison Berry was recently awarded a Bullard Fellowship in Forest Biology by Harvard University. She will spend a six-month sabbatical next year at Harvard Forest and the Harvard campus in Cambridge, Massachusetts, studying urbanization and its landscape impacts. She hopes to gain perspective on future landscape horticultural practices and environmental remediation techniques.

Dr. Truman Young was awarded $88,000 from CALFED (via the Audubon Society) to study, with student **Megan Lulow,** "Determinants of successful upland rangeland restoration (in Yolo County)". Truman also received a grant from the National Science Foundation, with **Dr. Maureen Stanton** of the Division of Biological Sciences and grad student **Todd Palmer**, for $305,000 for the project "Testing multiple mechanisms of species coexistance in a guild of African acacia-ants".

Dr. Mimoum Mokhtari is visiting again from Morocco to work on and perhaps finish his Ph. D dissertation under the guidance of **Dr. Michael Reid**. He is always a welcome visitor to the department.

Glen Forister recently received a college-wide award for his "general service to the campus". He was nominated by **Ron Lane**. Congratulations, Glen!

Greenhouse superintendent, **Ron Lane,** and Ph. D student , **Loren Oki**, will teach a class this summer for University Extension entitled "Introduction to Greenhouse Management". Both have extensive industry experience and the appropriate academic perspective that should make this three-day class valuable for growers and greenhouse managers. The class offers continuing education units and PCA credits.

Jim Geiger and **Dr. Greg McPherson** of the Western Center for Urban Forest Research and Education will also teach a summer University Extension class. "Creating and Managing a Community Forest" is the subject of this two-day class aimed at providing urban forest professionals information on calculating the benefits of urban trees, assessing the status of a community forest and managing challenges through partnerships and public events. This class also offers continuing education units and may offer ISA credits.

Find out more about summer University Extension classes at their website:
www.universityextension.ucdavis.edu

Notes From the Chair... By Dave Burger

This will be my last opportunity to contribute to this section of Growing Points since I will step **up** from being Chair on June 30, 2001. If you want to know the truth, I haven't actually contributed much to this section before... I've simply proofread and edited material that was given to me and had it placed under my picture. I know it's terrible, but I figured you could handle the truth. After a year's sabbatic leave, I'll hopefully return to the Department in 2002 to continue my research and teaching.

When I started as Chair of the Department of Environmental Horticulture in 1995, *Growing Points* was an occasional publication with little direction distributed to an incomplete list of interested readers. I thought the Department of Environmental Horticulture needed a professional looking outreach publication that would, on a regular basis, highlight our research, teaching and extension programs as well as bring information to you related to environmental horticulture that was taking place elsewhere. Since I had significant control over the budget I was able to "find" funds to support the important mission of *Growing Points. Growing Points* would not be possible without the consistent effort of a Managing Editor. Early on, Susan Imboden brought her enthusiasm and significant organizational skills to getting *Growing Points* back up and running smoothly. For the last two years, under the expert guidance, creativity and critical eye of Linda Dodge, *Growing Points* has continued to inform and sometimes entertain its reading audience.

The range of topics covered in the last five years of *Growing Points* has been myriad and diverse including articles on recycled water for landscapes, new turfgrasses for California, restoration horticulture, cut rose production and postharvest care, improved nitrogen management, a look at sustainable landscaping practices, planting trees for solar control and an overview of the ornamental horticulture industry in California. Along the way we had some fun with the "Ex" files, profiled members of our extended Environmental Horticulture family, kept track of students/scholars who have spent time with us and, unfortunately, had to say goodbye to those who had passed, Harry Kohl and Daniel Axelrod.

I've enjoyed reading *Growing Points* because it reflects the collective creativity of so many people in and around the Department of Environmental Horticulture. I look forward to the continuing publication of *Growing Points* and hope I can do something more notable than simply being Chair in order to find my name or my work in future issues.

All the best to you,

Dave

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