Fall 2006 - Vol. 10, Issue 3

CORF news

Floriculture Education from the Kee Kitayama Research Foundation

Substrates and Their Use

by Donald J. Merhaut - University of California, Riverside

The types of substrates and soil amendments used in agriculture over the years have been quite diverse, with changes occurring as a result of fluctuations in product availability and production costs. Substrates such as peat are becoming more expensive, and there is concern about preserving the peat bogs and reducing carbon dioxide emissions that result from draining and removing peat from the bogs. In the United Kingdom, the Biodiversity Action Plan was put into place in 2004; it states that the use of peat in pot substrates must be reduced to 10% by 2010. However, "new" by-products from other agricultural practices have been introduced which can easily replace peat. Of these materials, products such as composted rice hulls and the husks of coconuts (also known as coir) have become cost-effective alternatives to peat when used properly. In this article, we will discuss what important chemical and physical parameters to consider so that you know how to choose substrates to customize your media blends based on your crop needs.

Field-grown crops usually can be grown with minimal additions of amendments to optimize the physical and chemical characteristics of the native soil. However, in containerized plants, the root environment is much different: (1) there is a larger concentration of roots in a small space; and (2) con-

Substrates and Use cont. on page 2

Using Up Wastewater on the Farm

by Valerie J. Mellano - UC Cooperative Extension, San Diego County and Catherine Grieve - USDA Salinity Laboratory

Nursery operators are faced with numerous dilemmas associated with water quality. Regulations require them to capture irrigation runoff water from their nurseries, and any other operational water (everything except rainfall in most situations) also needs to be retained on the property. Runoff source reduction is generally the first line of improvement to be made, and includes upgrades to the irrigation system such as irrigation system uniformity, system maintenance and irrigation scheduling. Additional practices, such as re-routing illicit storm drain connections can

Using up Water cont. on page 4

Compost Use in Horticultural Media

by Emma Torbert and Richard Evans - Department of Plant Sciences, University of California, Davis

Compost is an economical substitute for potting media components like peat moss and wood products, whose prices increase as their supplies decrease. An understanding of the composting process can help growers make informed decisions about how, when, and where to use compost.

Composting is commonly defined as the controlled decomposition of organic materials. The natural process of decay is accelerated by creating an ideal environment for a diverse array of bacteria, fungi, and earthworms to convert organic waste products into humus.

Compost Use cont. on page 5

Editor's Note:

In this issue, we focus on some cultural management issues in the California floriculture and nursery industry. Our feature articles include: a primer on soil substrates-how to characterize and evaluate them for your use, another article on compost use in growing media, and one on wastewater use on the farm. Inside the newsletter, farm advisors report on their own local views on various cultural factors in "Regional Reports". Don't forget to read the continuing discussions in "Science to Grower", this time with an article on compost as a potting mix amendment. New publications from the University of California are available. Inside you will see a condensed list of publications that fit the interests of the floriculture and nursery industry. Finally, some snapshots of information from the UC campuses are found in Campus News and Research Updates.

- Steve Tjosvold, Editor, CORF News

IN THIS ISSUE

Substrates and Use cont. from page 1

tainers are usually above ground, possibly subjecting the roots and media to extremely high (120° F) temperatures.

Substrate Types:

There are many substrates available. The least expensive substrates are usually those that are derived from local sources. In California, many nursery growers may acquire products such as pine bark and rice hulls at fairly reasonable prices.

Inorganic substrates include native soils, sand, perlite, pumice, and vermiculite.

Organic substrates include coir-fines, coir chips, peat, composted plant waste, pine bark, cedar bark, rice hulls, ground nut shells, ground treefern wood, redwood shavings, and sawdust.

If substrates are selected properly, one can:
1) reduce the incidence of root pests and diseases;
2) reduce water and nutrient runoff;
3) improve plant growth; and
4) reduce production costs.

Physical Parameters:

1. Bulk density (BD) *is the weight per unit volume (i.e.: grams/2.4 L) and is directly influenced by substrate type and compaction of the media.* High BD substrates include native soil and sand. Low BD products include many organic substrates such as peat, coir, and pine bark. Using some sand as part of the media blend will increase weight of the container and reduce the likelihood of containers being blown over. However, too much of a high BD substrate, such as sand, will also increase shipping and handling costs. There is no linear correlation between BD and water-holding capacity or drainage.

2. Water-Holding Capacity (WHC) *is the ability of the substrate to absorb water.* As WHC increases, aeration decreases; therefore, while it is ideal to increase the WHC, which reduces the frequency of irrigations, the higher WHC also reduces the aeration of the media, which impairs root growth. The WHC is usually fairly uniform for individual substrates; however, differences may occur between batches based upon differences in particle sizes. For example, there are two components of coir: pith and fiber. In processing coconut husks, the fiber is separated and removed from the pith to manufacture rugs and other materials. The fiber has a lower WHC than the pith. Coir products can vary based on the percentage of pith vs. fiber; the more fiber, the lower the WHC, but the higher the aeration, and vice versa.

3. Aeration *is the concentration of air spaces in the substrates.* Roots require oxygen to carry out respiration, the physiological process of converting carbohydrates to energy. The aeration of a containerized media decreases from the top to the bottom of the container because a zone of water saturation, called "standing water", exists in containers. The more porous a mix, the smaller the zone of water saturation in a container. This saturation zone is greater for wider, shallow pots compared to deeper, narrow pots. The degree of aeration required is crop specific. Plants such as *Equisetum*, which can grow in standing water, require minimal aeration, while many California natives require excellent aeration.

4. Particle size *is the size of the substrate particles.* Usually, as particle size increases, WHC decreases and aeration increases. However, if a blend of different substrates of different particle sizes occurs, the physical properties of the resulting blended media can be quite varied, as smaller particles can sometimes fill in the gaps of the spaces between the larger particles.

5. Uniformity. *There is usually variability within a substrate source.* Piles of a material have fines settling out over time. Fines may settle to the bottom of a truck during shipping and the freezing and thawing cycles of stored peat can break apart fibers. Additional loss of uniformity occurs when substrates are poorly blended together to form a medium. Mixing substrates with a skip loader is not recommended. Fertilizer blending into the media should always be done with proper equipment.

Substrates and Use cont. on page 11

Pine bark substrate – a typical component in many nurseries media blends.

New UC Agricultural Publications Available

Compiled by Steve Tjosvold - UC Cooperative Extension, Santa Cruz and Monterey

Agritourism and Nature Tourism in California

by H. George and E. Rilla

Whether as an opportunity for curious urban dwellers to find out more about the food they eat, as a welcome weekend escape from an urban environment, or as a vacation destination – agritourism is growing. Farmers and ranchers are curious about how to take advantage of this trend.

This manual has been written to help farmers and ranchers determine if agritourism is for them. The easy-to-use workbook walks users through the steps needed to establish a tourism enterprise. Included are hands-on activities that can help one assess, plan, develop, and evaluate a farm or ranch's tourism potential. From U-pick orchards to bird watching, trail rides to farm tours – the possibilities are as endless as one's imagination. While written with California in mind, farmers and ranchers nationwide will find valuable analysis and planning tools in this handbook.

Publication 3484
$25.00
http://anrcatalog.ucdavis.edu/InOrder/Shop/ItemDetails.asp?ItemNo=3484

Scheduling Irrigations: When and How Much

Publication 3396 (New printing)
$25.00
http://anrcatalog.ucdavis.edu/InOrder/Shop/ItemDetails.asp?ItemNo=3396

Pesticide Choice: Best Management Practice for Protecting Surface Water Quality in Agriculture

Publication 8161
http://anrcatalog.ucdavis.edu/InOrder/Shop/ItemDetails.asp?ItemNo=8161

Fertigation with Microirrigation

by Blaine Hanson, Neil O'Connell, Jan Hopmans, Jirka Simunek, Robert Beede

Fertigation is the process of applying fertilizer through an irrigation system by injecting the fertilizer into the irrigation water. Microirrigation can apply water and chemicals in precise amounts and locations through a field. This manual helps guide users through strategies and decision making for fertigation with nitrogen, phosphorus and potassium, and gypsum. It discusses the environmental effects of chemical applications, and focuses on nitrogen management to reduce groundwater pollution. The guide also covers the characteristics of selected fertilizers commonly used for fertigation, long- and short-duration strategies, how to calculate injection rates, frequency considerations, how to apply fertilizers uniformly, mixing considerations, injection devices, and how to prevent backflow.

Publication 21620
$25.00
http://anrcatalog.ucdavis.edu/InOrder/Shop/ItemDetails.asp?ItemNo=21620

Retail Garden Center Manual

by Dennis Pittinger

This study guide was written for individuals seeking to become California Certified Nursery Professionals (CCN Pros). Developed through a partnership between the University of California Cooperative Extension (UCCE) and the California Association of Nurseries and Garden Centers (CANGC), this practical, easy-to-use manual covers important topics on basic horticulture, soil, fertilizer, and water management, plant problem diagnosis, integrated pest management, landscape design, and nursery sales. It also contains an appendix summarizing nursery laws and regulations, a glossary and an index.

From indoor plants to lawns – this is also a valuable reference for any career professional in the garden retail trade. As the primary information source for home gardeners, well-trained staff knowledgeable in basic horticulture is important to retailers wanting to better meet their customer's needs.

Publication 3492
$25.00
http://anrcatalog.ucdavis.edu/InOrder/Shop/ItemDetails.asp?ItemNo=3492

New Pricing: Postharvest Transport Series

Save 25% when you buy all three titles in the Postharvest Transport Series -- Air, Refrigerated Trailer, and Marine Container Transport. All of these titles can still be purchased separately.

Publication 21621
$36.00
http://anrcatalog.ucdavis.edu/InOrder/Shop/ItemDetails.asp?ItemNo=21621

Using up Water cont. from page 1

also improve the situation and bring the growers into compliance. Some growing operations require the use of very high quality water because of the types of plants that are being grown, or because of the stage of the products that are being produced. One San Diego County grower requires consistent, high quality irrigation water to successfully produce his plants in the short time he maintains the crop. He achieves this by using a reverse osmosis system to provide him with irrigation water that is far less salty than what he would be provided using district water or well water in this location. The water produced is of a very high quality, but he is left with a by-product or "brine" that must be dealt with. On the average, he produces between 2,000 and 4,000 gallons of brine each day with an EC ranging from 2.0 to 6.0 depending on the initial source of the irrigation water. This brine is generally too salty to apply to crop plants without serious plant quality concerns. While there are numerous plant types that will grow well when irrigation water with an EC of 2.0 or higher is used, the higher levels of salts are inhibitory to the growth of many plants. Since the levels of the salts in the brine vary, plants accepting this water must be able to utilize water with the higher levels of salts. As with other non-rainfall water, it is illegal to discharge this brine to the storm drain system, the street or any stream or creek running through the property. Using up wastewater such as this is very difficult for many growers due to lack of space and other factors. The ideal situation is to use the water on non-crop plants on site. The plants must be tolerant of the concentrated amounts of the components of the irrigation water, be non-invasive if they are being used near a stream or other waterway where they can potentially take over the native vegetation, and be high water users. As mentioned, most of the growers have very limited space, so attractive plants and plant groupings that can be planted in areas visible to the public are desired, as are planted areas that have some type of recreational use on the farm. Several growers indicated that they would like to have plant material that could both accept the lower quality water and be used in the outdoor lunch areas for their employees.

We are working with the USDA Salinity Laboratory adjacent to the UC Riverside campus to identify plants and plant groupings that serve to use up the lower quality water, and still provide an addition aesthetic or recreational use. The Salinity Laboratory has the ability to custom mix the components of the water to allow us to accurately assess the levels that prove to be detrimental to the plants in our experiments.

We are initially looking at four groupings of plants including turf, common ground covers, native low growing shrubs and non-native perennial shrubs. The plants are planted in 1.5 M x 3 M x 2 M cement block tanks with a contained watering and runoff capture system. Various water treatments are being mixed at the Salinity Laboratory and delivered to the plants. The treatments include Colorado River water as the baseline, as it is a common and consistent source of water for the Southern California area. Additional treatments include water that is augmented with two, four, six, eight and ten times the salts found in the Colorado River water. The plants are being assessed for their ability to withstand the various treatments and use up the water. Since the cement block tanks utilized for this experiment will also contain the water, we will be able to analyze the relative amounts of water used up by the various plantings, and be able to assess the components of the water after it passes through the root zone of the plants.

Data from the initial planting will be available spring of 2007. We will hopefully be able to further refine the data and make specific recommendations the following year. This project was partially funded by the California Cut Flower Commission through the Kee Kitayama Research Foundation in cooperation with the USDA Salinity Laboratory in Riverside, CA.❁

Table 1. Comparison of Selected Components of District Water and Reverse Osmosis Brine.

COMPONENT	UNITS	VISTA IRRIGATION DISTRICT* ANNUAL AVERAGE 2005	REVERSE OSMOSIS BRINE MINIMUM 2004-2005
EC	mhos/cm	.780	2.0
pH		8.1	7.88
Alkalinity	ppm	107	236
Calcium	ppm	55	129
Magnesium	ppm	23	55
Sodium	ppm	82	196
Chloride	ppm	88	195

** Vista Irrigation District is located in North San Diego County, and is part of the San Diego County Water Authority. The nursery described in this article is within the Vista Irrigation District.*

Catherine Grieve
USDA
ARS George E. Brown, Jr. Salinity Laboratory
450 W. Big Springs Rd.
Riverside, CA 92507
Phone: (909) 369-4836
Fax: (909) 342-4963
e-mail: cgrieve@ussl.ars.usda.gov

Valerie J. Mellano
Environmental Issues Advisor
UCCE San Diego County
5555 Overland Ave. Building 4
San Diego, CA 92123
Phone: (858) 571-4204
Fax: (858) 694-2849
e-mail: vjmellano@ucdavis.edu

Compost Use cont. from page 1

Decomposition is controlled by adjusting the feedstock, air flow, and geometry of the compost pile to rapidly achieve a high quality compost.

The majority of compost today is made in aerobic conditions at temperatures exceeding 105° F. The organic materials themselves act as their own heater and insulation, so piles should occupy at least one cubic yard to establish an adequately insulated volume of compost. A temperature of 130° F sustained for 3 days will kill most pathogens; and 160° F will kill most weed seeds. The two main commercial composting designs are reactors and windrows. Reactor designs use containers with forced aeration and mechanical turning. Windrows are less expensive but occupy more space: the materials are piled 5-6 feet high in trapezoidal rows, then turned intermittently with tractors. Municipal composting facilities use a combination of the two designs: plastic tunnels with imbedded air blowers contain the compost for the first 30 days, and then compost is removed and cured in windrows for 3-6 months.

Many materials can be composted, but the mixture of carbonaceous materials (wood chips, sawdust, straw) and nitrogenous materials (manure, food waste, nitrogen fertilizer) should have an initial carbon: nitrogen ratio (C: N) of 25. The proportion of dry to wet materials is also important – ideally the moisture content should be 50% by weight. Water can be added if the materials are too dry and extra turning will help reduce an excessive moisture content.

Compost is used mainly as a soil conditioner, since by weight, it has a relatively low concentration of fertilizing nutrients. Compost's high organic matter content increases the cation exchange capacity (CEC), water holding capacity and aggregation of mineral soils and it can be an effective substitute for traditional organic amendments in potting mixes. One significant benefit of compost is the potential suppression of plant diseases caused by *Pythium*, *Phytophthora*, *Fusarium*, and sometimes *Rhizoctonia solani*. Plant diseases are most effectively suppressed when the compost is cured sufficiently to prevent phytotoxicity, but not so much that it is unable to support a healthy microbial population.

Plant growth trials are the ultimate indicator of compost quality, but lab testing is commonly done. Key tests are: salinity, pH, C: N, maturity, organic matter percentage, heavy metal content, and nutrient content. Physical properties like particle size distribution, air filled porosity, and bulk density are also critical to evaluate composts for potting media. Recommended values for these tests are shown in Table 1.

Table 1. Variation in eight samples taken from food waste compost over a one year period at a municipal composting facility. All samples were taken 60 days after composting began; compost is not usually sold for another 2-4 months. The range of values found is shown, as well as the relative amount of variation for each parameter. The moisture, pH, salinity, organic matter, macronutrients are shown in Part A, heavy metal content in Part B (page 13), pathogen levels, and stability measurements are shown in Part C (page 13). The recommended limits from Wood's End Research Laboratory (WERL) for potting soil quality composts, US Biosolids limits from EPA rule 503, and Canadian and German standards are shown in the shaded rows.

Part A. Chemical Properties.

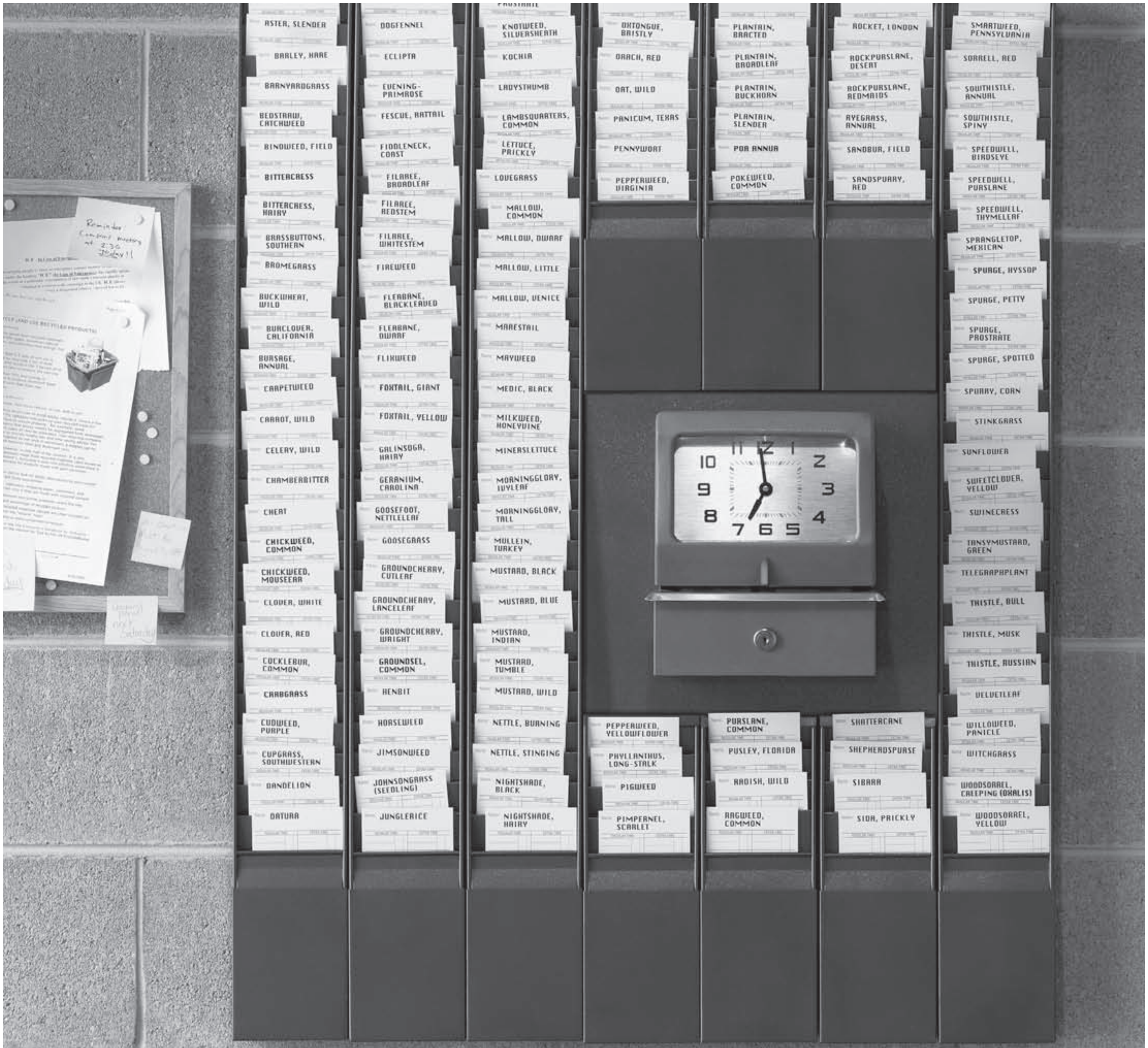
	Moisture (%)	pH	Salinity (mmhos/cm)	Organic Matter (%)	Total N (%)	P2O5 (%)	K2O (%)	C/N Ratio
WERL Limits	--	6-7	<2	>30	--	--	--	<25
Minimum	31.6	5.2	6.2	55.2	1.4	0.6	0.6	10
Maximum	50.1	7.3	15.7	67.3	2.7	1.2	1.1	24
Coefficient of Variation (%)	16.1	10.9	25.9	7.2	23.0	23.7	21.7	23.4

Maturity can be measured by an array of methods: the California Compost Quality Council (CCQC) has proposed a system where two different types of parameters are combined into a maturity index. One type of test assesses biological activity, usually by measurement of CO_2 respiration, oxygen demand or the Dewar self-heating test. The other type includes ammonia to nitrate ratio, ammonia concentration, volatile organic acid concentration, or a plant growth trial. In order to be rated as mature, a compost must pass one test from both groups.

The current federal standard that applies to compost production is the EPA Part 503 Biosolids Rule. This rule specifies the maximum fecal bacteria and heavy metal concentrations that are allowed when distributing biosolids. Any compost sold is only required to meet these regulations, and the purchaser is responsible for any further testing. Most compost facilities will furnish a report of the nutrient content, feedstock, organic matter content, C:N, and pH.

The main obstacle to widespread use of compost as a horticultural substrate is its lack of uniformity. Table 1 (Parts A-C) shows the variation in macronutrient content, heavy metals, salinity, pH, and stability from one municipal composting facility

Compost Use cont. on page 13


ASTER, SLENDER
BARLEY, HARE
BARNYARDGRASS
BEDSTRAW, CATCHWEED
BINDWEED, FIELD
BITTERCRESS
BITTERCRESS, HAIRY
BRASSBUTTONS, SOUTHERN
BROMEGRASS
BUCKWHEAT, WILD
BURCLOVER, CALIFORNIA
BURSAGE, ANNUAL
CARPETWEED
CARROT, WILD
CELERY, WILD
CHAMBERBITTER
CHEAT
CHICKWEED, COMMON
CHICKWEED, MOUSEEAR
CLOVER, WHITE
CLOVER, RED
COCKLEBUR, COMMON
CRABGRASS
CUDWEED, PURPLE
CUPGRASS, SOUTHWESTERN
DANDELION
DATURA
DOGFENNEL
ECLIPTA
EVENING-PRIMROSE
FESCUE, RATTAIL
FIDDLENECK, COAST
FILAREE, BROADLEAF
FILAREE, REDSTEM
FILAREE, WHITESTEM
FIREWEED
FLEABANE, BLACKLEAVED
FLEABANE, DWARF
FLIXWEED
FOXTAIL, GIANT
FOXTAIL, YELLOW
GALINSOGA, HAIRY
GERANIUM, CAROLINA
GOOSEFOOT, NETTLELEAF
GOOSEGRASS
GROUNDCHERRY, CUTLEAF
GROUNDCHERRY, LANCELEAF
GROUNDCHERRY, WRIGHT
GROUNDSEL, COMMON
HENBIT
HORSEWEED
JIMSONWEED
JOHNSONGRASS (SEEDLING)
JUNGLERICE
KNOTWEED, SILVERSHEATH
KOCHIA
LADYSTHUMB
LAMBSQUARTERS, COMMON
LETTUCE, PRICKLY
LOVEGRASS
MALLOW, COMMON
MALLOW, DWARF
MALLOW, LITTLE
MALLOW, VENICE
MARESTAIL
MAYWEED
MEDIC, BLACK
MILKWEED, HONEYVINE
MINERSLETTUCE
MORNINGGLORY, IVYLEAF
MORNINGGLORY, TALL
MULLEIN, TURKEY
MUSTARD, BLACK
MUSTARD, BLUE
MUSTARD, INDIAN
MUSTARD, TUMBLE
MUSTARD, WILD
NETTLE, BURNING
NETTLE, STINGING
NIGHTSHADE, BLACK
NIGHTSHADE, HAIRY
OXTONGUE, BRISTLY
ORACH, RED
OAT, WILD
PANICUM, TEXAS
PENNYWORT
PEPPERWEED, VIRGINIA
PEPPERWEED, YELLOWFLOWER
PHYLLANTHUS, LONG-STALK
PIGWEED
PIMPERNEL, SCARLET
PLANTAIN, BRACTED
PLANTAIN, BROADLEAF
PLANTAIN, BUCKHORN
PLANTAIN, SLENDER
POA ANNUA
POKEWEED, COMMON
PURSLANE, COMMON
PUSLEY, FLORIDA
RADISH, WILD
RAGWEED, COMMON
ROCKET, LONDON
ROCKPURSLANE, DESERT
ROCKPURSLANE, REDMAIDS
RYEGRASS, ANNUAL
SANDBUR, FIELD
SANDSPURRY, RED
SHATTERCANE
SHEPHERDSPURSE
SIBARA
SIDA, PRICKLY
SMARTWEED, PENNSYLVANIA
SORRELL, RED
SOWTHISTLE, ANNUAL
SOWTHISTLE, SPINY
SPEEDWELL, BIRDSEYE
SPEEDWELL, PURSLANE
SPEEDWELL, THYMELEAF
SPRANGLETOP, MEXICAN
SPURGE, HYSSOP
SPURGE, PETTY
SPURGE, PROSTRATE
SPURGE, SPOTTED
SPURRY, CORN
STINKGRASS
SUNFLOWER
SWEETCLOVER, YELLOW
SWINECRESS
TANSYMUSTARD, GREEN
TELEGRAPHPLANT
THISTLE, BULL
THISTLE, MUSK
THISTLE, RUSSIAN
VELVETLEAF
WILLOWWEED, PANICLE
WITCHGRASS
WOODSORREL, CREEPING (OXALIS)
WOODSORREL, YELLOW

Media Matters for Imidacloprid

by James A. Bethke - UC Cooperative Extension, San Diego

Neonicotinoids, such as imidacloprid, are the latest generation of insecticides and they are very effective against the homopterans (aphids, leafhoppers, mealybugs, psyllids, scale insects, and whiteflies). Neonicotinoids have become useful in all aspects of ornamental production and especially in the production of poinsettias. Unfortunately, little information is known about the behavior of neonicotinoids within the growth media and subsequently, within the plant itself. It is difficult, therefore, to know when to apply, reapply, or change modes of action when it is not known how long it takes for a neonicotinoid to translocate throughout the plant, how long it takes to reach an effective level, or its level of persistence. Effective use of these products in ornamentals will remain a best guess estimate unless some of these questions are answered.

Here's what we know from soil applied imidacloprid in recent field trials in vineyards and the corresponding laboratory assays of the different soil types.

Laboratory-based soil column studies confirmed that different soil properties account for differences in imidacloprid uptake in vineyards found in Coachella, Napa, and Temecula. In these studies, the movement of imidacloprid through the Coachella soil column was more rapid, whereas the movement through the Temecula and Napa soil columns were slower. This illustrates the impact that soil-type can have on insecticide availability. Under similar watering conditions, imidacloprid is bound more tightly to the clay soil of the Temecula and Napa vineyards, compared with the sandier soils of the Coachella vineyard. If lab studies mimic conditions in the field, then imidacloprid will remain available for uptake into Temecula vines for a longer period. In addition, there are considerable differences between the regions in the amounts of water used during irrigation. In Coachella Valley, where vast amounts of water are applied daily to each vine, it is possible that imidacloprid is washed past the root zone before significant uptake can occur. In contrast, soils in Temecula vineyards can bind imidacloprid more effectively, and with typically lower water volumes used during irrigation, more effective uptake of imidacloprid is achieved.

What does this mean for ornamentals? The widely different media used in ornamental production such as coir, rock wool, and the common nursery media will have a profound effect on the uptake, efficacy, and persistence of imidacloprid in ornamental production. It also means that there is much to learn.

Using the same laboratory-based soil columns mentioned above, we are in the process of determining how imidacloprid acts in various ornamental media including the common hydroponic media. In addition, research is underway that will determine the concentrations of imidacloprid within plant tissues such as potted poinsettia, hydroponic gerbera daisy, and field grown calla lily. Results from these trials and more will be forthcoming.

James A. Bethke
Acting Floriculture Farm Advisor
UC Cooperative Extension
5555 Overland Ave. Building 4
San Diego, CA 92123
Phone: (951) 827-4733
Fax: (858) 694-2849
e-mail: james.bethke@ucr.edu

Myoporum Thrips Trial Results

by James A. Bethke and Dave Shaw

Almost nothing is known about the efficacy of common pesticides against the myoporum thrips. Therefore, we are conducting a trial in a 75 linear foot planting of myoporum in a landscape setting. We decided to trial three common ornamental products: abamectin, imidacloprid, and spinosad. To date, we've made two applications, three weeks apart. Efficacy is assessed weekly by collecting six growing tips from each block and counting the number of thrips in each sample. In addition, we are conducting host plant damage assessments over time. Results so far indicate that imidacloprid is performing best by bringing the number of thrips to extinction. Abamectin and spinosad have reduced the number of thrips, but small numbers remain. Plant damage has declined over time in the treated blocks, and the damage roughly correlates with the mean number of thrips per treatment. Spinosad is arguably the best thrips product on the market at the moment, but surprisingly, imidacloprid, which is only supposed to suppress thrips, is working very well. Considering that the myoporum thrips create a protected enclosure much like the Cuban laurel thrips, we think that imidacloprid, a systemic product, has a better chance of reaching the intended target; whereas abamectin and spinosad are having difficulty contacting the thrips. There will be more to come when the trial is finished.

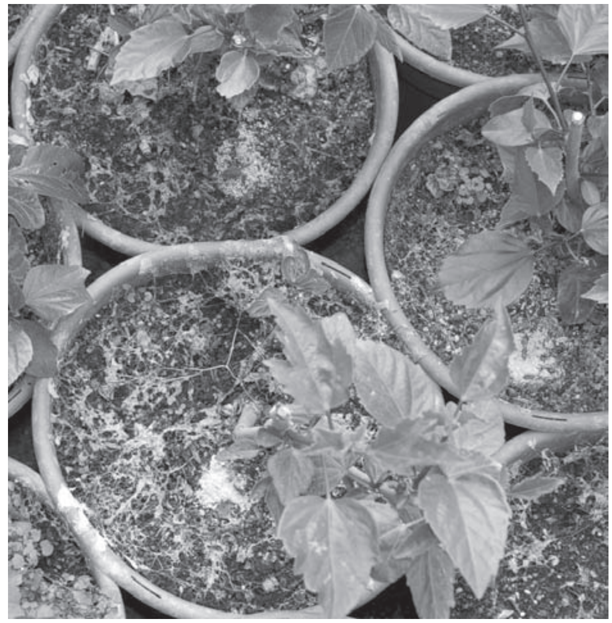
Dave Shaw
Floriculture Farm Advisor
UC Cooperative Extension
5555 Overland Ave.
Ste 4101, Building 4
San Diego, CA 92123
Phone: (858) 694-2853
Fax: (858) 694-2849
e-mail: dshaw@ucdavis.edu

Top Dressing Fertilizers: *to spread or not to spread?*

by Steve Tjosvold - UC Cooperative Extension, Santa Cruz and Monterey

Should you always spread fertilizer out evenly on the surface of potting soil or field soil? Or can you just apply the appropriate amount of fertilizer in piles? These were interesting questions I asked myself on two recent occasions when I visited a grower of greenhouse cut flowers and a grower of container ornamentals. At the container nursery, I saw a measured pile of slow release nitrogen fertilizer in each container instead of spread out over the surface of the relatively large 15" diameter pots. At the other nursery, I saw neatly placed piles of a soluble complete fertilizer placed on the soil surface about every foot or so between rows of carnation plants. All the application rates were appropriate for the crop size, container size, and soil type. But what about those piles of fertilizer? This did not sit well with me. Fertilizer may be conveniently and efficiently applied by the applicator in piles, but once dissolved, would these applications eventually produce an inappropriately high concentration of salts in part of the root zone? Would the piles of fertilizer be effectively utilized by the plant? Would it be better to take the time to spread the fertilizer out evenly over the surface with each application?

Maybe a review of the fundamentals of fertilizer placement and movement is in order before I try to answer these questions. First, merely applying fertilizer does not ensure that it will be taken up by the plant. Placement should consider irrigation method, the mobility of the fertilizer nutrient, soil type, and root characteristics. Of course, you should only be applying the amount of fertilizer that correlates with the growth rate of the plant. Soluble nutrient salts are released from any fertilizer, be it slow-release, completely soluble, or organic. They are dissolved in the soil solution surrounding the zone of fertilizer application, which becomes relatively concentrated. High soluble salts can be detrimental to plant growth, especially when the salts are in the root zones of seedlings or transplants. Phosphorous (P), in the form of phosphate, moves very slowly from the point of placement. Nitrogen salts move with the soil solution, mostly up and down, with the direction of water movement. Of the two principal nitrogen (N) salts, nitrate-nitrogen moves more readily than ammonium-nitrogen. With time and conducive soil conditions, ammonium-nitrogen is converted to the nitrate-nitrogen form.



Fertilizer piled onto surface of 15" potted ornamental. Would it be better if the fertilizer was spread uniformily over the surface?

Potassium (K) as a soluble salt is also positively charged and tends to attach to soils, and therefore its movement is restricted. Irrigation method greatly influences movement of soluble fertilizer nutrients. Movement is primarily vertically, up and down; downward with irrigation and rainfall, and possibly upward as the soil surface dries. The extent of movement is influenced by soil texture. With sandy and most good potting soils, there is usually a greater freedom of soluble salt movement, both upward and downward, than with heavy soils. Given the fact that two of three of the principal nutrients (potassium and phosphorus) do not move readily in the soil, the placement of fertilizer should be targeted to where the roots are found or where they could readily grow and develop. In a review article "The Responses of Plants to Non-Uniform Supplies of Nutrients" (D. Robinson, 1994), the author summarizes the scientific literature on this subject. Generally, some plants are highly adaptable to non-uniform supplies of nutrients in the soil in certain situations. Roots grow readily around relatively high concentrations of fertilizers and effectively use the nutrients, as is seen with the common practice of fertilizer banding in field operations. Furthermore, there was evidence in the literature that shoot growth and development can compensate partially for a spatially localized supply of nutrients. Plants can be remarkably adaptable to fertilizer placement.

So could fertilizer be placed in piles on the surface of pots or field soil, or would fertilizer be best applied evenly on the soil surface? Well, I did not find any research relating to this specific question so I get to take some academic freedom to comment. I do not believe the horticultural fundamentals support any advantages of the practice of piling fertilizer on the surface. Plants will make the best use of the piles of fertilizer, as I'm sure they did in the nursery plants that I observed. But there are potential drawbacks. When fertilizer is piled up on the surface, excessively high

Top Dressing cont. on page 10

Are You Cuckoo for Coconut Coir?

by Julie P. Newman - UC Cooperative Extension, Ventura and Santa Barbara

If you have recently switched to coir and are pleased with the results, you are not alone. Coconut fiber (also called coir) is a relatively new growing medium which is becoming popular throughout the world in potting mixes and as a substrate for hydroponics. If you are new to coir, it's important to understand its limitations as well as its advantages before trying it.

Advantages:

- Coir has significantly higher water-holding capacity than rockwool and sphagnum peat moss. Additionally, coir readily absorbs water; therefore, a wetting agent is not needed, as with sphagnum peat.

- Because of the high lignin content, coir breaks down slowly, thus keeping the media structure open. This allows air to better penetrate, encouraging larger, healthier roots. The resiliency of coir varies depending on age and form, generally lasting 2-4 years.

- The pH of most commercially available sources of coir range from 5.8 to 6.5. Therefore, liming is not required as it is when using sphagnum peat.

- There are no disposal problems associated with coconut coir, as with rockwool. Unlike sphagnum peat moss, which is a depleting resource with strict regulations to protect the bogs it is extracted from, coir is essentially a waste product of the coconut industry.

- Coir can deter fungus gnats and algae growth by keeping the top surface of the containers dry, whereas peat can encourage these problems due to a moist soil surface. How well fungus gnats and algae are controlled using coir depends on the grower's watering preferences and the environment.

In spite of its advantages, the trend in potting mixes is to combine coir with other components to reap the benefits of other elements. For example, when mixed with peat, coir can improve peat by allowing the water to be taken in more readily, without a wetting agent. Peat mixes can also improve consistency of coir so that there are fewer clumps of "coir furball".

Disadvantages:

- The most common problem with coir is that it can have an extremely high salt content, especially in the lower grades. The electrical connectivity (EC) of coir can range from 0.3 to 2.9 mmho/cm. Coir with high salts needs to be leached before use. Additionally, chloride levels of 400 to 700 ppm are not uncommon. However, these chloride levels typically do not present a problem so long as the EC is in an acceptable range.

- Coir that is salty is usually due to suppliers washing the coconut husks with salt water instead of freshwater. The problem can be resolved by buying from a reputable dealer. Cheaper coir with high EC may actually be more expensive than higher-priced coir at an acceptable EC level once you add in your labor for leaching and the cost of the additional water.

- Cation-exchange capacity is lower than that of sphagnum peat and there are significant amounts of phosphorus and potassium in coir. Thus growers switching from sphagnum peat to coir find they need to change their fertilizer practices. Additionally, because coir has different water holding properties, switching to coir from peat necessitates changing irrigation practices.

Julie P. Newman
UC Cooperative Extension
669 County Square Drive, Suite 100
Ventura, CA 93003-5401
Phone: (805) 645-1459
Fax: (805) 645-1474
e-mail: jpnewman@ucdavis.edu

Observations

Rose rust forms small orange pustules on undersides of leaves and may discolor upper sides.

Photo: Jack Kelly Clark, UC Davis

Managing Rust

There are many rust diseases of ornamental plants. Some are "new" (e.g. chrysanthemum white rust and daylily rust), which have been under eradication programs in California.

The rust fungi are obligate parasites in the order Uredinales. Many have complicated life cycles that include four different spore stages and two distinctly different hosts. Other rusts, (e.g. rose rust), produce all or sometimes only one type of spore and infect only one kind of plant.

Rust pustules appear as powdery masses of yellow, orange, purple, black, or brown spores on leaves and sometimes on stems. Pustules are usually found on the undersides of leaves. Discoloration may occur on upper leaves.

Use resistant varieties when possible, e.g. different varieties of daylily have different susceptibilities to rust. However, rust resistance in cultivars is often short-lived as many rust fungi mutate and adapt quickly. Because water is necessary for infection, overhead irrigation should be avoided when rust is a problem; keeping leaves as dry as possible. Improve plant spacing to allow faster drying and better coverage of fungicides. If possible, eliminate alternate hosts if they occur, prune off infected stalks, and remove infected plants when detected early. Break the production cycle by rotating to another non host crop.

Strobilurins (e.g. Heritage®, Compass®, Cygnus®) are some of the best products for rust control. Sterol inhibitors (e.g. Eagle®, Terraguard®) can also be very effective. Mancozeb (e.g. Protect T&O®, Fore®, Dithane) is generally effective if used as a protectant. Coverage is critical. The spray interval for eradication should be once a week; spraying more frequently can worsen downy mildew and botrytis due to excessive wet sprays on the foliage.

2007
CORF Program Calendar

JANUARY 2007

23 ABC's of Plant Nutrition

and Fertilizer Management

Ventura

(English Only)

Stay Tuned

for information regarding our 2007 schedule:

- additional dates/locations for the ABC's of Plant Nutrition and Fertilizer Management (English!)
- NEW! ABC's of IPM Practices
- Grower Tour

Top Dressing cont. on page 8

salt concentrations can inhibit root growth in the area immediately at and below the fertilizer application on the surface. This would be more likely the case when soluble fertilizers versus slow release fertilizers are used as topdressings. As mentioned earlier, plants adapt to relatively high, even excessive, concentrations by finding the right concentration and develop within that zone, but they do not develop in excessively high concentrations. Checking the development of roots in the container or field soil may confirm whether excessive salts are limiting the soil volume in which the roots can grow. Limiting the effective soil volume is fundamentally wrong. The rooting area should be maximized, especially in containers or shallow rooted crops in the field where the potential rooting volume is very limited in the first place. Plants need a full complement of roots for structural strength and to maximize water and mineral adsorption. If fertilizer is needed and applied to the surface, a uniform application to the surface would maximize the soil volume that the roots could adsorb the nutrients. This would be especially important if a complete fertilizer containing N, P, and K were used because the movement of potassium, phosphorus, and ammonium nutrients would be minimal. So in summary, piling fertilizer in convenient applications might save a little bit of time, but in doing so you might not be maximizing the potential for plant growth.

Steve Tjosvold
UC Cooperative Extension
1432 Freedom Blvd.
Watsonville, CA 95076-2796
Phone: (831) 763-8040
Fax: (831) 763-8006
e-mail: satjosvold@ucdavis.edu

Substrates and Use cont. from page 2

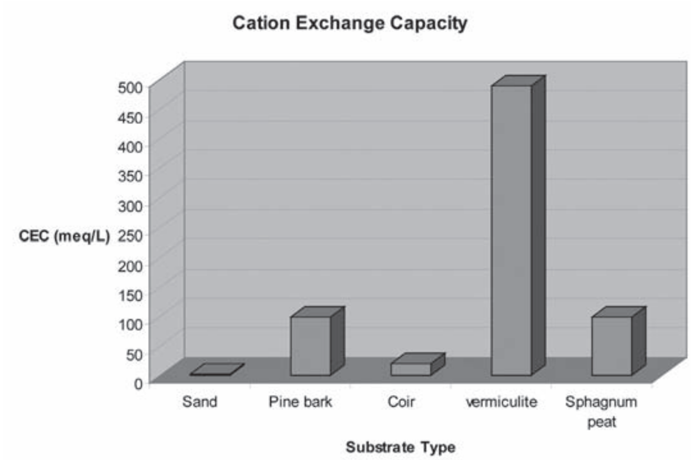


Figure 1. Cation Exchange Capacity (CEC) of different substrates.

6. Ease of mixing *is a quality in substrates based on the physical properties of the particles.* Some fibrous substrates, such as course shredded redwood bark or shredded cedar bark do not go through mechanical conveyors well. Therefore, while these products may have some favorable physical and chemical properties for root systems, their suitability for use with certain nursery equipment should be carefully considered.

Chemical Parameters:

1. Cation Exchange Capacity (CEC) *is the ability of a substrate/soil particle to adsorb positively-charged elements and compounds.* Such as calcium (Ca^{+2}), magnesium (Mg^{+2}), ammonium (NH_4^+), potassium (K^+), iron ($Fe^{+2,+3}$), zinc (Zn^{+2}), manganese (Mn^{+2}), and copper (Cu^{+2}), onto the negatively-charged outside surfaces of the substrate/soil particles. This is similar to iron filings attaching to the outside of a magnet. The CEC of some common substrates is presented in Figure 1.

2. Anion Exchange Capacity (AEC) *is the ability of a substrate/soil particle to adsorb negatively charged compounds.* Such as nitrate (NO_3^-), phosphates ($PO_4^{-,-2}$), and sulfates (SO_4^{-2}), onto the positively-charges outside surface of the substrate/soil particles. In general, the AEC of most substrates is 1-5% of the CEC of the substrates. This low AEC of substrates/soils is one of the primary reasons why compounds, such as nitrates and phosphates, are easily leached.

3. Soluble Salts (Electrical Conductivity-EC) *is the amount of soluble fertilizer salts and organic salts in the media and water.* It is called "electrical conductivity" (EC) because the concentration of dissolved salts in the water is directly related to the ability of the water to transfer or conduct an electrical current. Common units for EC are decisiemens per meter (dS/m), millisiemens per centimeter (mS/cm), or millimhos per centimeter (mhos/cm). 1 dS/m = 1 mS/cm = 1 mhos/cm. Usually, city water supplies have EC around 0.5 dS/m. Many cut flower crops have a water EC tolerance below 2.0 dS/m while many woody ornamentals may have a tolerance of 3.0 dS/m or greater for optimum plant performance. However, there is a broad range of tolerance among crops. In addition, the seedling stage of many plant types is more sensitive to soluble salt levels than the same plant at maturity.

4. Acidity *or solution pH is the measure of acidity (H^+) or alkalinity (OH^-) of a soil solution or of 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^+ ions. Please refer to CORF articles 2005-2006 for the series on pH in irrigation water and media.

5. Disease Resistance/Sterility *of substrates is quite variable.* Some products contain chemicals that are suppressive to certain root pathogens. Many substrates and field soils undergo sterilization to kill all microorganisms (both beneficial and harmful).

6. Water Rewetting Ability *is the characteristic of the substrate to rewet after drying out.* Products such as peat are notorious for being difficult to rewet (hydrophobic). Other products such as coir are easy to rewet. Such products are considered hydrophilic or "water loving".❁

Proper turning of compost piles to provide aeration throughout composting process.

Donald J. Merhaut
Department of Botany & Plant Sciences
University of California
4118 Batchelor Hall
Riverside, CA 92521
Phone: (951) 827-7003
Fax: (951) 827-5717
e-mail: donald.merhaut@ucr.edu

Science to the Grower

Compost as a Potting Mix Amendment: *too much of a good thing?*

by Richard Y. Evans - Department of Plant Sciences, UC Davis

Nutrient-rich compost to either soil or a peat-based mix promoted tomato growth.

Composts have been touted as amendments for potting media because of beneficial physical properties, disease suppression, and addition of nutrients. However, not all composts are alike. Differences in source material and composting methods may result in substantial differences in compost maturity, chemical composition, amount of available plant nutrients. Such differences can affect decisions about how much compost, if any, to use in a potting mix.

Researchers at the University of Massachusetts looked at how growth of transplanted tomatoes was affected by rates of compost addition.[1] They compared two composts, one nutrient-rich and the other nutrient-poor, which had been made from animal manure and either bark or sawdust. Compost amendments rates were 0, 25, 50, 75, or 100% by volume, and plants were irrigated with either water or a nutrient solution containing 200 ppm nitrogen (N), 45 ppm phosohorus (P), and 160 ppm potassium (K). Addition of the nutrient-rich compost to either soil or a peat-based mix promoted tomato growth, but growth in compost alone was worse than in unamended media. The nutrient-poor compost at rates exceeding 25% suppressed growth. 19 improved tomato growth at all rates of compost addition, but the nutrient-rich compost still outperformed the nutrient-poor one. Overall, the best results occurred at compost additions of 25%. Higher rates had no effect or inhibited growth. The authors speculated that high potassium concentrations in the nutrient-rich compost may have inhibited calcium uptake, and that nitrogen immobilization may have inhibited growth in the nutrient-poor compost.

Veeken and others at Wageningen University in The Netherlands studied the disease suppressiveness of composted, wet-sieved biowaste in potting mixes.[2] The mixes contained 15% perlite and variable amounts of peat and compost such that 0, 20, 40, or 60% of the mixes was compost. Bioassays using cucumber plants were conducted to test for disease suppressiveness against *Pythium ultimum*. Disease suppression by the compost increased from 31 to 94% as the percentage compost in the mix increased from 20 to 60%. Disease suppression was correlated with the respiration rate of the potting mix, which increased as the proportion of compost increased. These high rates of addition were feasible because wet sieving prior to composting otherwise would cause phytotoxicity. The authors emphasize that the benefits from high rates of compost addition are not possible unless the biowaste is wet sieved prior to composting. It would be interesting to know if wet sieving would have improved results at high rates of compost addition in the University of Massachusetts study, too.❁

[1] Barker, A.V. and G.M. Bryson. 2006. Comparisons of composts with low or high nutrient status for growth of plants in containers. *Communications in Soil Science and Plant Analysis* 37: 1303-1319.

[2] Veeken, A.H.M., W.J. Blok, F. Curci, G.C.M. Coenen, A.J. Termorshuizen, and H.V.M. Hamelers. 2005. Improving quality of composted biowaste to enhance disease suppressiveness of compost-amended, peat-based potting mixes. *Soil Biology & Biochemistry* 37: 2131-2140.

Richard Y. Evans
Extension Specialist
Department of Plant Sciences
University of California
Davis, CA 95616
Phone: (530) 752-6617
Fax: (530) 752-1819
e-mail: ryevans@ucdavis.edu

Compost Use cont. from page 5

during eight samplings from 2005. While some parameters like organic matter and the Solvita test were relatively constant, important parameters like respiration rate and plant growth trials varied significantly.

Other potential problems in compost use are high heavy metal concentrations in municipal compost, immaturity, and high salinity. Composting concentrates salts and nutrients, and salinity above 2 dS/m can affect plant growth in potting soils. Leaching prior to planting will correct the problem in most cases, but may contribute to nursery run-off.

The future of compost use in horticultural media depends on increasing its uniformity and developing better labeling of composts that meet horticultural standards. The benefits of compost, including its low cost, availability, soil properties and disease suppressiveness, make it worth the effort.

Part B. Heavy Metal Content.

	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Zinc (mg/kg)
USA Biosolids Limit	39	1200	1500	300	420	36	2800
Canada Limit	3	210	100	150	62	2	500
Minimum	1	18	69	46	12	1	192
Maximum	5.7	21	328	120.6	28.6	6.1	535
Coefficient of Variation (%)	87.7	7.7	80.0	30.8	37.4	92.5	45.6

Part C. Stability and Pathogen Properties.

	Cucumber Germ. & Growth	Respiration Rate (mg CO_2/g OM/day)	Solvita Rating	Fecal Coliform (MPN/gram)	Salmonella (MPN/gram)	Inerts (%)
Recommended Limit	90 *	2-8 **	7-8 ***	1000 ****	0.75 ****	<1 ***
Minimum	0	13	5	<2	0	<0.5
Maximum	100	23	5	42	<0.75	<1
Coefficient of Variation (%)	69.1	18.7	0.0	282.8	33.8	34.0

* *German standards (German Institute for Quality Certification and Declaration) are that barley seeds must pass >90% growth and germination for 25% and 50% compost use. Cucumber test is done with 50% compost use.*

** *Soil Control Lab tests label <2 mg CO2 per g OM/day as very stable, 2-8 as stable, 8-15 as moderately unstable, 15-40 as unstable and >40 as very unstable.*

*** *Wood's End Research Lab (WERL) labels a 7-8 Solvita rating as very mature, 5-6 as mature and <5 as immature. A rating of 7-8 is recommended for potting soil. <1% inerts is recommended for potting soil.*

**** *US EPA rule 503 regulates the maximum limit of fecal coliform and salmonella.*

Editor's note:
Participants are being sought for the Santa Cruz County Compost Demonstration Project. Project participants will be provided with high quality compost at no cost, but hauling and application will generally be the responsibility of the user. Agricultural users are especially encouraged to participate.
For more information, contact Dan deGrassi, Santa Cruz County Public Works, (831) 454-3102.

Emma Torbert
Graduate Student
Department of Plant Sciences
University of California
Davis, CA 95616
e-mail: eetorbert@ucdavis.edu

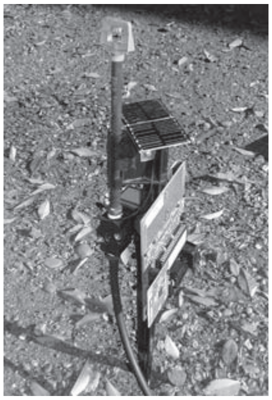
Richard Y. Evans
Extension Specialist
Department of Plant Sciences
University of California
Davis, CA 95616
Phone: (530) 752-6617
Fax: (530) 752-1819
e-mail: ryevans@ucdavis.edu

Campus News & Research Updates

submitted by Julie P. Newman - UC Cooperative Extension, Ventura and Santa Barbara

Wireless Valve Controller Network for Site Specific Water and Nutrient Application

by Michael J. Delwiche, Robert W. Coates, Patrick Brown, Richard Evans and Loren Oki - University of California, Davis



Wireless valve controller.

Nurseries deal with continually changing inventory and must comply with environmental regulations limiting runoff and fertilizer leaching. Site specific irrigation and fertigation could help remedy these problems, but to be accepted by growers, such a system must be easy to install and operate. Solar lighting for landscapes is popular because homeowners simply push a stake into the ground for installation. We envision the same type of solar-powered, low-cost controllers to operate water valves. We are developing wireless valve controllers using simple radio modules that self-assemble into a network and communicate with each other by passing messages. A miniature solar panel will charge an internal battery so that little maintenance is required. Sensors will be used to monitor water pressure, fertilizer flow, soil moisture, or other factors which can be used to optimize system operation and detect clogging, leaks, or breaks. This network of intelligent valve controllers will allow growers in nurseries to develop management practices for application of water and fertilizer in a more ecological and sustainable manner. The system also has application in orchards, vineyards, greenhouses, and landscapes.

Understanding Environmental Behaviors of Pyrethroid Pesticides

by Jay Gan - University of California, Riverside

Pyrethroids usually have a "thrin" affix in their chemical names. This class of insecticides is gaining popularity with the loss or use restriction of other products for insect control. Many products containing pyrethroids are used on nursery crops. Recent monitoring studies by a few groups in California stimulated widespread interest regarding the environmental risk, especially water quality risk, of pyrethroid insecticides. This article is intended to help you understand the unique behaviors of pyrethroids by looking at their basic properties.

Compared to other pesticide families, synthetic pyrethroids are a very unique class of compounds. The most notable property of pyrethroids is their high affinity for solid phases. Pyrethroids have negligible solubility in water, but are extremely hydrophobic and therefore adsorb strongly to soil (or sediment) particles. This property contributes to their unique behaviors observed in the environment.

1. Move with soil particles: The strong adsorption determines that after application, pyrethroids are predominantly associated with the surface soil. They will move offsite only when the soil particles have eroded away under the force of storm runoff or irrigation induced runoff. The average K_{oc} of pyrethroids is around 10^6. Assuming that average soils have a 1% organic carbon content, over 99.99% of a pyrethroid is adsorbed to the soil phase. Therefore, the appearance of pyrethroid residues in streams is most likely a result of winter storm runoff and in-stream resuspension. At nursery sites, it is likely that irrigation runoff moves pyrethroids to the edge of the property, while storm runoff carries the deposited residue further into the stream.

2. Sink to the bed sediment: Their strong affinity to the solid phase also determines that once in a surface stream, pyrethroids will quickly deposit onto the bed sediment. Early studies show that upon entry into a pond from drift, pyrethroids quickly disappeared from the water column and sank to the bottom. This behavior suggests that on one hand, the toxicity of pyrethroids may occur only in the bed sediment, and on the other hand, only after bed resuspension can a pyrethroid move further downstream. Occurrence of bed sediment resuspension depends on the flow conditions, and is likely important only during active storm events. This points to the likelihood that storms, especially early season storms, transport pyrethroid residue into surface streams, while later storms may "push" pyrethroid residue further downstream through in-stream resuspension. During dry months, irrigation induced runoff of pyrethroids is likely limited to the close proximity of the treated sites.

3. Mitigation strategies: The fact that pyrethroids are readily adsorbed to soil and sediment particles also implies that any method that removes suspended particles from the runoff stream or prevents soil erosion will be effective at reducing pyrethroid runoff. The potential mitigation strategies include:

- Surface and bank stabilization
- Surface covers (e.g., gravels, mats)
- Edge-of-the-field berms
- Sedimentation and recycling ponds
- Check dams
- Polyacrylamides (PAM)
- Vegetative ditches or grassed swales

These practices work because they prevent the entry of loose sediment or soil materials (containing pyrethroids) into the runoff, or slow down or stop the runoff flow, allowing the settling or retention of the suspended solids. The rule of thumb is that if the runoff is muddy, most likely there are high levels of pyrethroids in the runoff and practices should be implemented to either reduce the amount of runoff, or clean the runoff.

Obituary for Anton Miles Kofranek

Submitted by Heiner Lieth and Micheal Reid - Department of Plant Sciences, University of California, Davis CA

Anton (Tony) Miles Kofranek, professor emeritus at the University of California, Davis, died March 29, 2006, in Davis after a bout with cancer at the age of 85.

Campus News cont. on page 15

Campus News cont. from page 14

Born in Chicago on Feb. 5, 1921, to Antonin and Emma Kofranek, Tony served in the Army Signal Corps during World War II, first in the European Theater and then in the Pacific, where he served during the occupation of Japan.

He received his bachelor's degree from the University of Minnesota in 1947, and his master's and doctorate degrees from Cornell in 1950 under Professor Kenneth Post. Dr. Kofranek became a professor of floriculture at UCLA in 1950, and moved, with other department members, to Davis in the 1960s to found the Department of Environmental Horticulture. He was Professor of Horticulture from 1968 until his retirement in 1987.

Tony was best known for his work in the development of ideal production methods for azaleas, chrysanthemums, poinsettias and bulb crops. Cyclical photoperiodic lighting of chrysanthemum, which he pioneered, is still in use today. He also made many contributions in postharvest handling of flowers.

In addition to numerous articles in scientific journals and trade magazines, Tony authored and co-authored several books and publications during his career, including the University of California Azalea Manual and the textbook "Plant Science". In addition to being elected a Fellow of the American Society for Horticulture Science in 1979, Professor Kofranek was a recipient of the prestigious Alex Laurie research award in 1993, and a number of other professional awards including: the Award of Merit from the California State Florist Association, the Garland Award, and a teaching award from the Society of American Florists. In recent years he was honored with the research award from the California Association of Nurseries and Garden Centers in 2004 and induction into the California Floriculture Hall of Fame in 2003.

Tony loved to travel and served as a visiting professor in The Netherlands, Israel and Egypt. He consulted in South Africa, India, Colombia and the Canary Islands. He traveled extensively during retirement and maintained a continued interest in floriculture while indulging in his passion for philately, even publishing a CD on Swiss Federal Administration-Issued Stamps, 1850-1854, and their Forgeries. His colleagues, students and friends in the floriculture industry remember an enthusiastic, friendly, and ebullient professor, who contributed substantially in teaching, research, and outreach. Steve Tjosvold, UCCE Farm Advisor, remembers him as most important person that encouraged him to return to UC Davis for graduate research and studies.

Former students Steve Tjosvold (left) and Cliff Low (right) congratulate Dr. Anton Kofrenek (center) on his induction into the California Floriculture Hall of Fame on Oct. 7, 2003. Photo by: Evan Pilchik Photography

Michael J. Delwiche
Professor
Biological and Agricultural Engineering
University of California
3048 Bainer Hall
Davis, CA 95616
Ph: (530) 752-7023
e-mail: mjdelwiche@ucdavis.edu

Robert W. Coates
Engineer
Biological and Agricultural Engineering
University of California
1 Shields Ave
Davis, CA 95616
e-mail: rwcoates@ucdavis.edu

Patrick Brown
Director
Dept of Ag and Env. Sciences
University of California
260 Hunt Hall
Davis, CA 95616
Ph: (530) 752-8474
e-mail: phbrown@ucdavis.edu

Lorence (Loren) Oki
Assc. Cooperative Extension Specialist
Department of Plant Sciences
University of California
1108 Env Hort
Davis, CA 95616
Ph: (530) 754-4135
e-mail: lroki@ucdavis.edu

Richard Y. Evans
Extension Specialist
Department of Plant Sciences
University of California
Davis, CA 95616
Phone: (530) 752-6617
Fax: (530) 752-1819
e-mail: ryevans@ucdavis.edu

Jay Gan
College of Natural & Agricultural Sciences
University of California
Science Laboratories I 210
Riverside, CA 92521
Phone (951) 827-2712
Fax: (951) 827-3993
e-mail: jianying.gan@ucr.edu

Heiner Lieth
Professor/Extension Specialist
Department of Plant Sciences
University of California
1001A Env Hort Bldg
Davis, CA 95616
Ph: (530) 752-7198
e-mail:jhlieth@ucdavis.edu

Michael Reid
Professor
Department of Plant Sciences
University of California
102 Mann Lab
Davis, Ca 95616
Ph: (530) 754-6751
e-mail: msreid@ucdavis.edu

CORF

FLORICULTURE EDUCATION FROM THE KEE KITAYAMA RESEARCH FOUNDATION

CORF News is published three times a year and is a 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*.

California Ornamental Research Federation
820 Bay Avenue, Suite 109
Capitola, CA 95010
Phone: (831) 479-9724
Fax: (831) 603-4092
www.corf.org

Address Service Requested

THANKS to these Sponsors of CORF Educational Programs

ANR UNIVERSITY of CALIFORNIA

CALIFORNIA ASSOCIATION OF FLOWER GROWERS • SHIPPERS

CALIFORNIA CUT FLOWER COMMISSION

ohp Partners with solutions

syngenta

WESTERN FARM SERVICE

Sustaining Sponsors

Arysta Life Sciences
Chemtura
Gowan Company
Romeo Packing
Target Specialty Products