



Landscape, Floriculture, and Ornamentals News



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Landscape, Floriculture, and
Ornamentals Industries*

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Caesalpinia, the Other Bird-of-Paradise

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This article is adapted from one by Dr. Jimmy Tipton, University of Arizona. Jimmy died of cancer this past summer. He was a friend, colleague, and an excellent horticulturist. We will miss him greatly.

In Hawaii we associate bird-of-paradise with the monocot *Strelitzia reginae*. In the Southwest some *Caesalpinia* species are also known as bird-of-paradise. There are 70 species of *Caesalpinia*, principally ever-

green and deciduous trees and shrubs from tropical and subtropical regions of the Americas. Four of these are used as landscape plants in the arid Southwest and are grown, or can be grown, in Hawaii.

Caesalpinias are legumes with alternate, bipinnate leaves. Their flowers are borne in terminal racemes on current growth. Butterflies pollinate the flowers, which also attract hummingbirds. The green fruit and seeds of *C. gilliesii* can cause serious stomach and intestinal irritation if eaten. Symptoms are nausea, vomiting and profuse diarrhea for about 24 hours. However, hulled green seeds of *C. pulcherrima* are reputed to be edible with perhaps some medicinal value. Maybe under the right circumstances vomiting and purging could be considered medicinally valuable. The bottom line is that you probably shouldn't include the fruit or seeds of these plants in a garden salad. On the other hand, the toxicity problems do not sound so serious as to preclude using or promoting these plants.

Caesalpinias' seed coat dormancy is weak, and slight scarification will usually enhance germination. Simply soaking the seeds in warm water for a few hours is usually sufficient. The seeds germinate best at warm temperatures (greater than 84°F).

Softwood subapical cuttings of *C. pulcherrima* have rooted within five weeks under intermittent mist when treated with 6,000 parts per million indolebutyric acid and bottom heat. To date, efforts to micropropagate these plants have been largely unsuccessful.

Libby Davison at the University of Arizona did production research on *C. pulcherrima* and found that seedlings grew best under long days and produced more nodes. Soil drenches of 3.75 parts per million uniconazole suppressed stem elongation without affecting flower initiation or axillary branching.

All species of *Caesalpinia* like hot weather and do not do well in cool, humid, environments. Like many desert-adapted plants, they prefer full sun and well drained soil. They have modest nutritional requirements,

although they may show iron chlorosis on heavy soils. This is usually easily controlled with iron chelates. These plants are susceptible to cotton root rot (*Phymatotrichum omnivorum*) but have few insect pests. This may be due to their production of toxic compounds, because flower extracts kill snails and diamondback moth larvae.

These plants are often used as accents or for borders. *Caesalpinia gilliesii* and *C. pulcherrima* can be pruned into small trees and are often used in street landscapes and median plantings. All four species perform well under drip irrigation in dry landscapes.

Four popular species

Caesalpinia cacalocoa (seez-al-pin-ee-ah kah-kah-loh-koh-ah) is the newest addition and is not widely available. I do not know of its presence in Hawaii. It is native to Mexico and is commonly called cascalote or Mexican bushbird. This species forms, over time, a vase-shaped large shrub or small tree 10–18 feet tall and 12–15 feet wide. Stems are slightly recurved with rosely thorns. The semi-evergreen, medium-textured foliage is dark green, and flowers are true sulfur yellow. Unlike the other species, the flowers appear in fall and winter.

Caesalpinia gilliesii (gill-is-ee-eye) has been cultivated the longest and is the hardiest of the four species. It is grown in Hawaii but is not very common. Originally from Argentina and Uruguay, this species has been widely planted and is naturalized in Mexico. It was popular in the high-elevation deserts of the American Southwest, but that popularity has declined somewhat due to weediness. At higher elevations *C. gilliesii* is sometimes called Mexican bird-of-paradise, or simply bird-of-paradise. At lower elevations it is more commonly known as desert or yellow bird-of-paradise. This bird will form a narrower shrub 6–12 feet high and 4–8 feet wide. It can be pruned to a standard or cut back to maintain a hedge. Foliage is finer textured than the other species. Leaves are 3–5 inches long with 6–12 pairs of pinnae, each with 5–9 pairs of leaflets. Stems are somewhat malodorous (they smell *pilau*). The flowers are creamy yellow, sometimes tending to orange. The 10 stamens are red and conspicuous, extending well beyond the petals. This bird can flower throughout the summer, but the best show is in late spring and early summer. At fruit dehiscence, seeds are ejected forcibly and fly out a considerable distance.

Caesalpinia mexicana (mex-i-cah-nah) is widely available on the Mainland but is still uncommon in Hawaii. Commonly called Mexican bird-of-paradise, it can become a large shrub or small tree 10–15 or even 30 feet tall and 6–15 feet wide. As the name implies, this plant is native to northern Mexico. It occasionally escapes cultivation in South Texas but has not yet done so in Arizona. Mexican bird-of-paradise blooms in summer, producing bright sulfur-yellow, fragrant flowers on racemes that are 3–6 inches long. Dark-green, medium-textured foliage distinguishes this bird from the other species. Leaves are 4–6 inches long with 2–3 pairs of pinnae and a terminal pinna. Each pinnae supports 4–5 pairs of leaflets.

Caesalpinia pulcherrima (pull-chair-i-mah) is certainly the most popular species of *Caesalpinia*. We know it in Hawaii as dwarf poinciana or ohai-alii. It is also sometimes called 'Pride of Barbados'. *C. pulcherrima* is native to the tropics, most likely the West Indies, but is naturalized throughout much of the American tropics. The plant does not escape in the Southwest, where it is usually called the red bird-of-paradise.

Dwarf poinciana can reach 6–15 feet tall and as wide. The current year's stems sport weak, slightly recurved thorns and medium-textured foliage. Leaves are large, 8–15 inches long with 3–9 pairs of pinnae. Each pinnae bears 7–12 pairs of leaflets.

The dwarf poinciana blooms year round in Hawaii. Flowers are large with conspicuous red stamens several times the length of the petals, up to 2½ inches long. Petals are yellow-orange, turning red with age. There are also selections available with yellow flowers and pink flowers.

These *Caesalpinia* species can do much to enhance our landscapes in Hawaii. The toxicity question should probably be clarified. There are 66 other species of the genus to evaluate and, if necessary, explore the possibility of nontoxic cultivars.

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The Agave, a Striking Addition to the Landscape

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Looking like huge green flowers reaching for the sky, the eye-catching agaves make a bold statement. While particularly attractive, these huge succulents can look mighty unfriendly with their sharp spines, which have made them very effective for corralling livestock in farmyards of their native Mexico and South America. Formed by an enormous rosette of wide strap-like leaves ranging in color from green to gray and variegated combinations, agaves are a staple in rock or desert gardens but also do nicely near the ocean.

All the species share a love of sandy soil with good drainage and all will die back after flowering. Blooms do not appear for many years however, and suckers will immediately replace the previous growth. Among the most popular of the nearly 30 species obtainable are *Agave americana*, *A. attenuata*, and *A. vilmoriniana*. Each has distinctive properties that make it suitable for different landscape needs.

Agave americana (century plant) is named for the infrequent production of the flower stalk that appears approximately every 10 years. This variety is not threatened by drought and is comfortable in coastal communities. Mature specimens will reach 8 feet in width and 6 feet in height, with leaves 10 inches wide and 5 feet long.

The massive scale of the *Agave americana*, as well as the spines which grow along the sides and top of each leaf, make it a variety you really don't want to consider moving. Leaves are a dusty green and make a great companion to the pale colors used in many arid gardens. Also available are variegated cultivars such as 'Marginata' with yellow leaf margins or 'Variegata' with twisted leaves that are deep green and yellow. When the century plant finally flowers, it puts forth a formidable 15–40-foot stalk bearing yellowish green flowers that appear staggered and branching at the top. It is not too difficult to imagine that the plant needs 10 years between each blooming period to rest!

Agave attenuata, a more manageable 3–5-foot wide by 4-foot tall species, is distinguished by its thornless, gray-green, nearly translucent leaves. In Hawaii where the marine influence is felt, *Agave attenuata* requires richer soil and consistent watering, although it can tolerate poor soil and drought. However, it will not do

well in full, hot sun. The majestic flower spike, embellished by tiny, creamy yellow flowers, consists of a 12–14-foot trunk that bends toward the earth and tapers to a blunt point.

Agave vilmoriniana, the octopus agave, is less frequently used but can contribute just the right accent in the proper setting. Spiraling and bending yellow to pale green leaves are toothed and crowned by a 1¼-inch spine on the top. The leaves are narrow for an agave, only 3–4 inches wide, but can be 32 inches long. The leaves are also much thicker than other agaves described here, and are held on a looser rosette. A full-grown specimen will be about 6 feet wide. It resembles a thrashing starfish thrown onto dry land. The *Agave vilmoriniana* is an accent plant worth a second look.

While agaves are prized for their sisal fibers for rope and floor coverings as well as their sap, which is distilled to make tequila in their native land, here in Hawaii they furnish a much different commodity. A truly unique genus that is admired for the size, shape, texture and variety of its species, agave is a worthy addition to many landscapes. There are few sights more awe-inspiring than an agave in full bloom. And while time and space limits this discussion to just a few of the more popular varieties that are readily available, there are many more to consider. These unusual and under-utilized succulents can provide an accent that will bespeak the imaginative talents of dedicated landscape professionals.

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Virus Damage Reported on Kula Anthurium Farms

Desmond Ogata, manager of the Plant Disease Clinic at the Agricultural Diagnostic Service Center, CTAHR, has confirmed the presence of tomato spotted wilt virus on several anthurium farms in Kula, Maui. Damage on the anthuriums includes small white "ghost" spots on the leaves that gradually become necrotic, and other chlorotic spots on the foliage. The affected farms are in an area of Kula that also has a large number of vegetable farms. Ogata suspects that the virus was transmitted by thrips from these neighboring areas, although none of the insects were collected from the affected anthurium farms. All of the infected anthuriums were destroyed. Ogata suggests that any new discoveries of this insect-borne viral disease be reported to the Cooperative Extension Service and all infected plants be immediately destroyed.

Employee Relations: Being a Better Boss

These ideas might help your employees want to go to work, rather than making them feel they have to.

Because it is service-oriented, the green industry's most important asset is its employees. Well trained and dedicated employees are its backbone.

Start by letting all employees know exactly what is expected of them and what they can expect from you. Set up rules and make sure everyone follows them. Always remember to treat them as human beings—they are not machines. They have needs and desires that must be respected. They have families and occasionally may need time off from work to attend to family matters.

Good performance should always be recognized and, on occasion, be rewarded in some way. However, do not make praise too cheap. People need to know that the boss sees their good work and appreciates it. The boss also needs to let employees know when they have "messed up." Don't make this an embarrassing moment for them. Take them aside, away from the other employees, to speak to them about what went wrong. Ask them if they recognize what happened and how they can avoid making the same mistake again. Rewards for good performance don't have to be expensive. Often, simple recognition at a group meeting is enough. One idea for a simple award could be an "Attaboy" (or "Attagirl!") Award presented to employees that come up with time- or money-saving ideas.

If you want, you might even include a small cash award along with a certificate as an extra incentive. Ideas for awards could be "Best Crew of the Year," "Most Improved Employee of the Year," or "Rookie of the Year."

Individual dealings

When dealing with individual employees on a daily basis, keep the following ideas in mind.

- 1) Treat everyone as an individual with individual needs.
- 2) The "shop steward" idea for a small company does not work. Allow all employees to talk directly to the boss. Plan any sensitive meetings during off-hours or away from the office. Any employee can be made to feel very low if asked to please leave the office so the "big bosses" can talk.
- 3) Listen to what all your employees have to say.
- 4) Ask them for their opinions and input on such things as daily work assignments.
- 5) Put up a suggestion box for the shy ones who find it difficult to talk to the boss face to face. You'd be surprised how many good ideas there are out there, but not

discovered because of a person's fear of ridicule.

6) Share good news with your employees, such as the birth of a child or the discovery of a good fishing hole. Doing this may lead to people opening up a little. They will become less afraid of talking about what might be on their minds.

7) Be personable, not personal.

8) When you're wrong, admit it!

Group dealings

When dealing with your employees as a group, some of the following suggestions might be helpful.

- 1) Set up regular meetings to discuss plans and set up work schedules. Keep them "on track."
- 2) Get them involved in some of the decision-making processes, such as when purchasing a new piece of equipment. They're the ones that must use this equipment every day, and they should know what they need to make the job easier and faster.
- 3) Let them know how the company is doing. Tell them as much as you can. They need not know everything—just those things that concern them on their job. Talk about new contracts that might be coming up. Tell them where you see the company being in 5 to 10 years, and what role they might play in it.
- 4) Provide plenty of training, either on a group or individual basis. Get your seasoned people involved in training newer ones.
- 5) Go out and work with the crews whenever your schedule allows.
- 6) If you have a building or room set aside for your employees' use, put up a bulletin board for safety posters, assignment sheets, a listing of "house rules," and other notices. Make sure you, or someone, inspect its condition on a regular basis. Don't just stick things on it and forget them.
- 7) Set up some kind of after-hours events such as softball games or a bowling night. Try to get as many of your people to attend as possible, and make sure that either you or one of your staff members also attends.
- 8) Last, but not least, when things don't go exactly the way you expected them to, keep your cool! People need stability, even in the workplace.

You'll find that good employee relations are as important as good customer relations and should receive as much attention, if not more, in their development and maintenance. Good employee relations will, in the end, improve your customer relations because your employees will develop pride in their company and will want to see it flourish.

Adapted from an article by Bill Pensyl who owns Green Thumb Services in North Brunswick, N.J.

Deactivate Pesticide Spills in Soil with Activated Charcoal

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The powerful adsorbent characteristics of activated charcoal make it an ideal medium for cleaning up or deactivating the toxic effects of many pesticides and other chemicals. Activated charcoal adsorbs 100 to 200 times its own weight and binds with most organic pesticides, thereby reducing the available level in the soil. However, it is not effective with inorganic pesticides such as arsenates, lead compounds, sodium chlorate, sulfur, borax, etc., nor is it effective with water-soluble organic pesticides such as aminotriazole, MSMA, and DSMA.

To reduce the effects from spills of organic pesticides, some petroleum products, and hydraulic fluids, use 100 lb of activated charcoal to every pound of active material, but no less than 2 lb per 150 sq. ft. (600 lb/acre) of contaminated area. If the active material has not been diluted with water at the time of spill, apply the charcoal directly as a dry powder. If the active material has been diluted with water, apply the activated charcoal in a slurry with constant agitation using common sprayer equipment. The charcoal must be incorporated into the contaminated soil, preferably to a depth of 6 inches. With severe spills, some of the contaminated soils may need removal prior to activated charcoal application.

Inactivation of turf herbicides

Turf areas that have been treated with preemergence herbicides can be reseeded earlier than normal by treating with activated charcoal. Whenever it is desirable to terminate the effect of a preemergence herbicide, apply charcoal slurry at a rate of 1 lb per gallon of water for each 150 square feet. Water the slurry into the soil, making sure the grass is washed free of heavy charcoal deposits. Where possible, it is desirable to thoroughly rake the charcoal into the soil. The area can be seeded 24 hours after treatment.

Flowable activated charcoal is available as "52 Pickup" from Parkway Research Corp., 13802 Chrisman Road, Houston, TX 77039; (800) 442-9821. Powdered activated charcoal is available from Brewer Environmental Industries, 311 Pacific St., Honolulu, HI 96817; (808) 532 7400.

(Adapted from an article by L.B. McCarthy, Univ. of Florida)

USDA Lowers Crop Insurance Premiums

Washington, January 8, 1999—Agriculture Secretary Dan Glickman today announced an estimated 30 percent premium reduction for farmers on their crop insurance policies. To ensure that all farmers have the opportunity to benefit from this one time premium reduction this year, crop insurance companies will accept insurance applications on crops having sales closing dates that have already passed.

For example, an insured winter wheat farmer in Texas having a sales closing date of September 30, 1998, for crop year 1999 coverage, now has until March 15, 1999, to evaluate the benefits of increased protection at a lower cost. Producers choosing not to insure last September will have the same opportunity to use the discount to obtain "buy up" protection. "Buy up" protection is an amount of coverage that is at least 50 percent of a farm's yield and 100 percent of an established market price.

"Given low crop prices, we want to ensure that as many family farmers as possible take advantage this year of the opportunity to increase their crop insurance coverage or benefit from reduced cost," said Glickman. "The plans we announce today will help provide farmers greater security."

The funds for this one-time incentive are part of the \$2.375 billion that Congress appropriated to assist farmers suffering from crop and economic losses. This initiative is the first element of the USDA's plan to strengthen the farm safety net.

The application period will provide eligible farmers time to take advantage of the discount by either applying for insurance or increasing their protection. The final percentage of premium discount will depend on how many farmers choose to insure or increase their protection and will be announced after sales have closed.

Due to the unique nature of citrus production, the premium discount will be applied to coverage on crop year 2000 production.

Farmers growing crops with sales closing dates between July 31, 1998, and February 15, 1999, are eligible to increase their protection or obtain crop insurance. **The application deadline for farmers in Hawaii is Feb. 28, 1999. Farmers should contact a crop insurance agent or the local Hawaii Farm Bureau Federation office for more information and to discuss their options.**

Getting an Edge on Lawn Spray Edgers

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Keeping a neatly manicured lawn is one of the home and professional gardener's main objectives and, because Hawaii's grasses grow so much, one of the biggest challenges. Certain lawn grasses like bermudagrass, St. Augustinegrass, and centipedegrass vigorously send out creeping runners during peak summer growing months, which can quickly frustrate gardeners. Hard-to-mow lawn areas next to fences, guard rails, sidewalks, buildings, trees, etc. are also a constant maintenance headache. There are several ways to keep these areas of the yard trimmed. Old fashioned muscle power and mechanical gadgets such as weed "whackers" and vertical edgers have been the traditional approaches used by lawn enthusiasts. In the past few years, however, herbicide sprays have gained acceptance as "liquid lawn edgers."

This article covers some of the spray materials available in Hawaii and evaluates their effectiveness. Keep in mind that these are non-selective herbicides, meaning they will kill any plant material they contact. It is therefore very important to prevent accidental drift onto non-target areas of turf or desirable landscape plants.

Chemical lawn sprays for edging

Roundup® (glyphosate) is a nonselective herbicide that is often applied as a spray to control lawn runners and hard-to-mow areas. Roundup is absorbed by plant leaves and shoots and translocated to the roots, thereby providing total plant kill in a matter of several days or more depending on plant size and time of the year. Activity is slowed during our cooler, slower growth periods and enhanced during the summer and early fall.

There are several Roundup products available in the marketplace, including those with dilute (ready-to-use) products, or concentrated solutions which require dilution. There are also Roundup mixtures (e.g., Roundup Pro®) with surfactants added, which is reported to provide a quicker burn (kill response) with less translocation, giving a neater, more defined trim line. Tank mixing Roundup with Scythe®, a fatty acid nonselective contact herbicide, acts to provide a more rapid kill and neater trim response as well. The general recommended rate of Scythe is a three percent volume to volume solution (4 oz of Scythe per gallon of finished spray solu-

tion) mixed with the recommended rate of Roundup (see label for rates for your particular application need).

Reward® (from Zeneca, Professional Products) is familiar to many as the aquatic and noncrop herbicide, diquat. Reward is quickly absorbed by turf, activity (darker tissue) is noticeable within hours, and a tannish colored top burn is obvious within 24 hours. A 75% non-ionic spreader (0.8–1.6 oz/gal of finished solution) should be used in tank mixes with this product (see label for required rates of Reward). The action of Reward is quite rapid on St. Augustinegrass and bermudagrass with little spread past the point of application. Reapplication frequency will depend on weather conditions and individual needs.

Finale® (Glufoninate-ammonium : ammonium-DL-homoalanin-4-yI-(methyl) phosphinate) by AgroEvo USA is a nonselective foliar-absorbed herbicide with no soil residual activity. Unlike the above products, the Finale® label does not specify the need for a surfactant or spreader. Of the materials mentioned, visual effects from the application of Finale take a little longer than Roundup Pro®, Roundup plus Scythe, or Reward. Complete top kill on stoloniferous lawn grasses may require additional applications.

Application methods

These herbicides are usually applied as sprays, but other methods such as rope and wick applicators are effective when used properly. For spot spray applications, avoid drift and/or direct application to nontarget materials and exposed roots. Use either a medium-flow solid cone spray nozzle or a flat fan nozzle for edging. Shielding nontargeted materials with tarps can be beneficial. For best control, make sure that thorough coverage is achieved. Incomplete coverage results in unattractive, alternating green and dead grass, wavelike patterns. Avoid spraying during windy conditions. In all cases, follow label instructions. Contact the CTAHR Cooperative Extension Service or the Hawaii Department of Agriculture, Pesticides Branch, for specific restrictions and additional information.

(Adapted from an article by John L. Cisar, Univ. of Florida)

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New Books

The Hawaii Plant Source Guide published by CTAHR is now on sale for \$5.00 (bulk orders of 10 copies for \$30.00). Shipping and handling is \$2.00 for 1 copy, \$3.00 for 2–7 copies, and \$5.00 for 10 copies. This directory lists 98 Hawaii nurseries and 140 plants considered desirable as houseplants and landscape plants for Hawaii, or that provide materials used in lei-making. The directory is divided into three sections. The first contains contact information for the nurseries and lists the plants that were available when the information was collected. The other two sections list, by island, the common name and scientific name of each plant, and the nurseries that offer them. To contact the CTAHR Publications and Information Office, call (808) 956-7036. fax (808) 956-5966, or email ctahrpub@hawaii.edu.

The 1999 Global Cut Flower Book published by the Flower Council of Holland is available for \$10.25 plus \$4.95 shipping and handling. This 143 page, 20th-anniversary edition features 801 popular cutflowers. Each flower is identified by its botanical name and cross-referenced by its common name in nine different countries. The seasonal availability of each flower is also indicated along with useful transport and storage information and tips on daily and weekend flower care. Also available are the Floral Indoor Plant book and Garden Plant book. (516) 621-3625

The Integrated Pest Management Guide for Nursery/Floral Producers is available from the Texas Agricultural Extension Service. The guide contains information on the latest IPM developments, biocontrol tactics, pest identification and management, traditional chemical control, and more. (409) 845-7341

Another Potential Insect Disaster

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What's all this white stuff on my Sago?

The insect responsible for the damage that has recently been reported on cycads in Hawaii is the cycad aulacaspis scale (*Aulacaspis yasumatsui*), according to Dick Tsuda of the CTAHR Agricultural Diagnostic Service Center at UH Manoa. The symptoms of this infestation are the appearance of brown and yellow leaves that are encrusted on the underside with a white substance. It seems to affect only cycads, particularly favoring the genus *Cycas* which includes the common king sago (*Cycas revoluta*) and queen sago (*Cycas rumphii*). If left unchecked, this scale insect can kill a mature cycad. This particular scale is of special note because it seems to be spreading rapidly throughout Hawaii.

Cycad aulacaspis scale is native to Thailand and southern China. It was accidentally introduced into Dade county, Florida, in 1995 and rapidly spread throughout southern Florida, where it has become a major problem. Unless immediate control measures are taken, it will also become a serious problem in Hawaii.

Once an infestation becomes severe, the symptoms are very obvious. Catching an infestation before it gets out of hand takes patience and close inspection. Look carefully at the underside of the cycad's leaves near the base with a magnifying lens. The adult females look like round white dots about 1/16 inch in diameter. The female's body is actually under the white waxy disk, which protects the female and gives the insect its name. The males are about the same size and color, but are thread-like in shape. If you look very closely, you might see tiny yellow specks moving about. These are the newly hatched scale insects, called crawlers. This is the only stage of the scale's life in which it can move to a new plant, carried by the wind. Once the immature insects settle on a plant, they will stay there for the remainder of their lives. The crawlers of this particular scale seem to be much more mobile than most types, resulting in an alarmingly rapid spread of the disease.

The female deposits eggs under her shell (scale). When the eggs hatch, the crawlers move away from the maternal scale to locate new feeding sites on the same or other cycads. When the crawlers settle and begin to feed, the characteristic armored scale covering is developed. Scale insects feed by sucking sap from the leaves.

The feeding can reduce the plant's vigor, making it more susceptible to drought, attack by other insects, or infection by diseases, which can lead to the death of a part of the plant or the entire plant.

Researchers at the University of Florida are working to find natural predators from this scale's native habitat. So far one species of beetle has been identified, but it has not yet been released in great enough numbers to evaluate its effectiveness. At this time the best method of control is the use of insecticidal oils. The typical insecticidal oil, such as Volk oil, is a petroleum product designed to kill insects without harming plants. It works by covering and suffocating the insects, not by poisoning them. It is less toxic to people and animals than most insecticides, and the scale cannot develop a resistance to the treatment. Insecticidal oils for warm-weather use are the most effective. These oils have "summer," "light-weight," or "ultrafine" on their label. Because oil and water do not mix easily, you will need to add a spreader or spreader/sticker to the mixture (a little bit of dish soap will do if you do not have a commercial product handy).

To control aulacaspis scale on a cycad

1. Remove only dead or completely yellow leaves. The plant needs all of its green leaves to produce energy for its recovery.
2. If the white covering of scale insect is very thick, spray the leaves and stems with a jet of water to wash away as much of the covering as possible. Adjust the spray to a level that does not damage the leaves.
3. After the cycad has dried, mix and spray the insecticidal oil according to the label directions. Be sure to cover the plant thoroughly, especially on the undersides of the leaves.
4. Repeat the insecticidal oil spray weekly for four or five weeks. The oil does not kill insect eggs, and you must kill new hatchlings. The oil is most effective when sprayed soon after a new generation of crawlers has emerged.
5. The dead scales will not fall off the plant easily, and new scale insects will find the plant again. Check the cycad for live scales by rubbing your finger across the white covering. If you see an orange coloration on your finger, some of the insects are still alive and you should continue the spray program. If the infestation is not controlled by the insecticidal oil alone, then adding a systemic insecticide such as Merit® may become necessary.

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Flower Award Winners

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FloraStar, a trialing and awards program for identifying outstanding new pot plants, announced two new winners. 'Global Neon Cherry' ivy geranium produces large, bright fuchsia, semidouble flowers. It has a trailing habit and produces velvety, dark purple flowers with a bright white picotee. 'Imperial' has good postharvest qualities and holds up well for a long time even in a hot greenhouse. Both are from Oglevee Ltd., Connellsville, PA, novovesky@florastar.com.

The latest FloraStar winner is lantana 'Patriot Hot Country'. Introduced by Am. Daylily & Perennials, it produces conical and full flowers that change from yellow/sienna to hot fuchsia, giving an overall mass of homogeneous fuchsia color. It is excellent for large landscapes and for standards. Am. Daylily also received a FloraStar award for lantana 'Patriot Rainbow' in 1994. florastar@florastar.com.

Florida plants of the year for 2000 have been named by FNGA. Greenhouse plants are *Didymochlaena truncatula* (mahogany fern), 'Ficus-Midnight', 'Ficus-TooLittle', and 'Ficus-Alii'. nga@aol.com, fnga@aol.com.

Check out the Assoc. of Specialty Cut Flower Growers' new web page at www.ascfg.org. The site includes a useful search guide for more than 90 different cutflowers (fresh, dried, and preserved) and the states in which growers of these flowers are located.

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Three New Cultivars For Hawaii's Cutflower Industry

Roy M. Yamakawa, Terry T. Sekioka,
Frank R. Matsuno, Robert E. Paull,
Carol A. Bobisud, and Stephen A. Ferreira.

CTAHR researchers have evaluated 22 clonal accessions of *Heliconia orthotricha* for commercial cutflower potential based on yield, vase life, and flowering season. As a species, *H. orthotricha* generally has excellent cutflower qualities. Three top performers that were selected and named are currently being propagated for commercial distribution.

In 1989 the Hawaii Tropical Flowers and Foliage Association (HTFFA) Kauai Chapter determined that a primary production bottleneck was the lack of high yielding, winter-blooming cutflower cultivars with sufficient vase life for exportation. Another major problem was that there was insufficient assessment and production information on introduced materials. This resulted in costly trial-and-error for growers. Through two collection trips to South and Central America in 1990 and 1991, 267 *Heliconia* accessions were brought back. The accessions were indexed for diseases, kept under greenhouse quarantine observation for one year, field-planted at the Kauai Research Station in Wailua, and assessed for landscape and pot production and, particularly, cutflower potential. In September 1992, Hurricane Iniki destroyed the plantings and set the project back by nearly three years.

Early on, field observations indicated that clonal accessions of *H. orthotricha*, as a species, possessed cutflower qualities that were sought by industry. Consequently, an expanded trial was installed to comprehensively assess 22 clonal accessions of *H. orthotricha*. The control was 'Edge of Night', which until that time was the only commercially established cultivar of *H. orthotricha* available. The project was funded by the Economic Development Agency of the U. S. Department of Commerce, through the County of Kauai Office of Economic Development, and CTAHR.

Planting material was also distributed to 17 cooperating commercial growers on Kauai for assessment and advance testing. In addition, these and other accessions were shared with the Maui Low Elevation Research Station (Clark Hashimoto), the Pearl City Urban Garden Center (Dale Sato), the Lyon Arboretum (Robert Hirano), and UH Manoa (Richard Criley). The plant material distributed was for research purposes only, and further distribution was prohibited.

Three of the top-performing clones were selected for commercial production based either on high flower yields, long vase life, or winter-blooming proclivity and named, respectively, 'Kauai Sunset', 'Kauai Morning Sun', and 'Kauai Christmas'.

Cooperator-growers are currently increasing the material, and CTAHR is coordinating distribution through the HTFFA-Kauai Chapter, according to CTAHR plant distribution policies.

Descriptions of the three *Heliconia orthotricha* cultivars available for ordering

'Kauai Sunset'

Inflorescence is erect, stout-bodied, and dark red. The bracts are distichous (in one plane), deep red, and pubescent. The upper margin and distal tip of the bracts are green, subtended by a wide, dark charcoal border. The rachis is compact and light yellow. Florets are subtended by a yellowish bract, with green petals and sepals, and distended by a whitish-yellow tip. Plant habit is musoid, with green leaves and petioles, which are also pubescent. The mean peduncle length is 75 cm, and the mean plant height is 124 cm. Average winter inflorescence production (two years mean from October through March) was 39 per plant mat; mean number of inflorescences for a 28-month period (March '94–June '96) was 88 per plant mat. Heaviest flowering is January through March with excellent flower yields and good vase life.

'Kauai Morning Sun'

Inflorescence is erect, light bodied, pale red with light yellow undertones, and fresh ("like the morning sun"). Bracts are distichous, light orange-red, and relatively nonpubescent. The upper margin and distal tip of bracts are green, subtended by a thin, black margin. The rachis is of medium length and pale yellow, which infuses into adjoining bracts. Florets are subtended by a pale yellowish bract, with green petals and sepals, and distended by a whitish-yellow tip. Plant habit is musoid, with green leaves and petioles. The petioles are glabrous (lacking pubescence). Mean peduncle length is 75 cm, and mean plant height is 121 cm. Average winter inflorescence production (two years mean from October through March) was 60 per plant mat; mean number of inflorescences for a 28-month period (March '94–June '96) was 196 per plant mat. Heaviest flowering is October through February with excellent flower yields and vase life.

'Kauai Christmas'

Inflorescence is erect, medium bodied, and crisp red and white. Bracts are distichous, bright cherry red, and pubescent. The upper margin and distal tip of the bracts are green, subtended by a thin, charcoal margin. The rachis is long and white, which infuses into adjoining bracts. Florets are subtended by a pale yellowish bract, with green petals and sepals, and distended by a white tip. Plant habit is musoid, with green leaves and petioles. The petioles are lightly pubescent. Mean peduncle length is 77 cm, mean plant height is 131 cm. Average winter inflorescence production (two years mean from October through March) was 53 per plant mat; mean number of inflorescences for a 28-month period (March '94–June '96) was 130 per plant mat. Heaviest flowering is December through February with excellent flower yields and good vase life.

To purchase rhizomes of these new plants contact:
Hawaii Tropical Flowers and Foliage Association
 (HTFFA)—Kauai Chapter
 PO Box 2015, Kapaa, HI 96746

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Some New Potentially Destructive Insect Pests In Hawaii

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James Tavares, county horticultural agent for the Cooperative Extension Service on Maui, keeps a very close watch on many potential and current problems in the nursery and landscape industries. James has reported the recent introduction of several new species of insects and gives warning of the possible damage these pests could produce.

Citrus blackfly, (*Aleurocanthus woglumi* Ashby), is one of the recent arrivals to Hawaii and has the potential to cause serious damage on citrus and other fruit trees. The blackfly is of Asian origin and was first detected in the USA in south Florida in 1937. It was once thought to be eradicated but was rediscovered in Ft. Lauderdale in 1976. It has since spread throughout Florida and Texas. The pest was first reported on Oahu

in July 1996, on a pummelo tree in Aiea and on a Meyer lemon tree in Wailae Iki. It was later found in Kihei, Maui, in August 1996. Desmond Ogata of CTAHR's ADSC says that it is presently infecting an increasing number of citrus, avocado, and mango trees in the Honolulu and Leeward areas of Oahu.

Citrus blackfly infests over 300 host plants, but citrus is the most suitable for large population development. Locally, other host plants of importance include mango, coffee, avocado, pear, plum, pomegranate, grape, sapodilla, rose-apple, sugar-apple, star-apple, soursop, sapote, breadfruit, guava, cashew, canistel, and others. It damages the plant by sucking juices from the foliage, which weakens the plant. It also produces honeydew and will have sooty mold associated with it. Sooty mold can cover the leaves and block sunlight from the leaf surface.

Citrus blackfly is actually a whitefly but gets its name because of its color. The eggs are laid in a spiral pattern on the underside of the leaf. A female can lay 2–3 egg spirals during her 10–14 day lifespan. Eggs hatch within 7–10 days, giving rise to the destructive larval stage, which consists of three different developmental forms, all of which feed by sucking the juices from the leaves of the host plant. These larval stages feed and mature for 21–66 days before forming a pupa, which will produce an adult blackfly in 16–50 days. The life cycle from egg to adult ranges from 45–133 days, depending on the temperature. In Hawaii, six generations per year can potentially be produced.

Citrus blackfly has several natural enemies. In Florida, the most effective are the parasitic wasps *Encarsia opulenta* and *Amitus hesperidum*. Here in Hawaii we are lucky to have both of these parasites present. Generally, *E. opulenta* can maintain a citrus blackfly population at a lower level than *A. hesperidum*.

Tavares notes that pesticides were being sprayed at both residences on Oahu where the flies were initially found. It seems that prior to spraying infestations were light, but they increased after spraying was carried out. It may be that pesticides are eliminating the parasites and predators, causing the blackfly population to increase. According to James, the best preventative measure at the moment is probably to keep the host trees as healthy as possible and allow the "good guys" to do their job. If a spraying must be done, use insecticides such as soaps, oils, and botanical derivatives that have little effect on the biological control agents.

Another new insect pest, the **aroid thrips** (*Psydrothrips luteolus*), was found in the Kahului, Maui, area in the summer of 1997. This thrip feeds on members of

the plant family Araceae, which includes locally grown aroids such as dieffenbachia, pothos, spathiphyllum, anthurium, taro, aglaonema, and syngonium.

The aroid thrips causes considerable damage by feeding on the unfurled young leaves. In the case of spathiphyllum, the damage shows up as a longitudinal stripe after the leaf has opened. On pothos, the unfurled leaves turn black, and the condition could be mistaken for a fungus disease problem. Larvae and adults hide and feed within the narrow space between the base of the young leaf petiole and vine, and more commonly between the loose layers of the young unfurled leaves. The mature larvae and pupae hide in the leaf axils of older leaves.

Tavares believes the aroid thrips may be more economically important to nursery growers because it can render plants unsaleable. In the landscape setting, damage may be more tolerable where parasites and predators are likely to be more abundant. The damage can also be pruned out.

Another recently introduced and potentially dangerous thrips has been identified as the **banana rust thrips** (*Chaetonaphothrips signipennis*). This one was originally discovered in 1996 on dracaena growing at a commercial nursery at Panaewa on the Big Island. It has since been collected in Kaanapali and other areas of Maui. As the name indicates, banana is one of its hosts. However, damage is to the skin of the fruit rather than the foliage of the plant. Feeding by this thrips causes a reddish, oval shaped stain between the fingers of the banana where they touch, and it can extend the entire length of the finger. In severe cases, the peel cracks.

Other known hosts are ti and anthurium. Like the aroid thrips, the banana rust thrips hide and feed in the tight whorl of young leaves, making them difficult to kill with insecticides. The thrips cause discoloration and silverying of leaves on dracaena. On ti, it causes white streaks near the petiole end of the leaves, and on anthurium damage is characterized by white streaks on the front and back of the spathe. These white streaks turn to bronze with age.

As with any new pest, the populations of these two thrips will probably increase further before natural or agricultural controls bring them down to stable levels. According to Tavares, we should allow the beneficials a chance to build up and “do their thing” before deciding to spray. This may not be possible in a nursery setting, but it should work in landscape situations.

Tavares advises that if spraying does become necessary, traditional systemic insecticide thrips control agents like imidacloprid (Merit®, Marathon®) or acephate

(Orthene®, Isotox®, etc.) would probably work, although no testing has been done on these particular thrips species. Many other contact insecticides have thrips listed on their labels, including Diazinon® and Sevin®. Because these insects hide in cracks and crevices and under unfurled leaves, adding a surfactant will increase the control you get from a contact insecticide by helping the chemical penetrate deeper into their living quarters.

If you notice black tips on your pothos or syngonium, if your dieffenbachia plants are looking ragged, stunted or dying back, or if you see unusual streaking on ti, dracaena, anthurium, or banana, you may have one of these new thrips. Take a sample in to the Cooperative Extension Service office for identification. The most effective way to fight any new pest is to quickly identify and control it before it has a chance to become established.

Note: Mention of trade names is to inform readers and is not a recommendation or an endorsement of these products by the University of Hawaii, the College of Tropical Agriculture and Human Resources, the Hawaii Cooperative Extension Service, or their employees.

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Update on Lethal Diseases of Palms

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Educational Specialist
Department of Horticulture

What would Hawaii be without its lovely palm trees? Could we call Hawaii an island paradise without palms? The recent discovery of a new virus on palms in Hawaii renews the need for everyone to be aware of why there are rules and regulations governing importing plant materials. The loss of palms would be economically devastating to our tourist-driven economy, and biologically devastating to our very fragile and unique ecosystem. Recent disease problems around the world have pointed a need to watch carefully for diseases that could devastate the environment here in Hawaii. The Hawaii Department of Agriculture quarantine program has been instrumental in protecting Hawaii from these disease threats.

Lethal Yellowing of palms has probably been around the Caribbean area for over 100 years. The disease was mentioned as a bud rot of coconuts in Jamaica around 1890, but it did not manifest itself as a serious threat until 1950. At that time large numbers of coconut palms in Jamaica and Key West began to die from the disease. It was estimated that from 1955 to 1965, 75 percent of all coconut palms in Key West were killed. The disease then went quiescent and was literally forgotten. However, in 1969 coconut trees began to die in Key Largo and Coral Gables, Florida. Thousands of coconut palms were killed in Miami and vicinity by 1972. The disease has been devastating to the landscaping industry in Florida and the Caribbean because the "tropical look" is thought of as palms in the landscape. Without them, you do not have that feel of the tropics.

Much research has been done over the years to identify and discover a treatment for the disease. Lethal yellowing is caused by an organism best described as between a bacterium and a virus, known as an MLO (mycoplasma-like-organism). It is single-celled and invades the vascular tissue of the palm plant. A sap-sucking plant hopper (*Myndus crudus*) transmits it. This insect has not been found in Hawaii, so at present Hawaii is safe from this disease.

There is no known cure for this disease, but research conducted by the University of Florida has indicated that injections of an antibiotic cocktail can prolong the life of the palm tree for many years. Tests to control the insect vector by spraying or other methods have not been successful because the insect can travel great distances and has other host plants to live on.

There are generally four recognized stages of lethal yellowing. The disease is particularly frustrating because infected plants have an incubation period of from 6 months to 2 years before symptoms appear.

The first stage is the premature dropping of fruit, regardless of size. This has been called "shelling." The fruits tend to have distinct brown or black watersoaked areas under the point where they attached to the palm.

The second stage is death or blackening of any new flowering inflorescence.

The third stage is usually the most visual and is how the disease was named. All fronds of the plant turn yellow, beginning with the oldest fronds and proceeding to the growing tip. There are some differences observed here among palm species. Some species will turn a grayish brown during the yellowing phase.

The fourth and final stage is the death of the growing bud or tip. This usually occurs with the advancing of the yellowing phase. Any newly emerging growth will

collapse and hang down. Once tip death has occurred, it is only a matter of time for the whole top of the palm to fall off. Infected trees usually die within 3 to 6 months after the first stage has been noticed.

Over 30 palm species are highly susceptible to lethal yellowing and particularly disturbing is that the Hawaiian native *Pritchardia* species appear to be very susceptible to this disease. Most tall coconut palms are highly susceptible, but some resistance is found in Malayan dwarf types (called Samoan dwarf in Hawaii). A new cultivar, 'Maypan' (Malayan dwarf x Panama tall), has shown resistance and also maintains the ability to grow tall, which most Malayan dwarf types do not possess.

This disease is slowly spreading around the world. It has been recently confirmed that thousands of Canary Island (*Phoenix canariensis*) and date palms (*Phoenix dactylifera*) died from this disease in southern Texas from 1979 to 1981. This event is viewed as a major threat to California and its million-dollar date palm industry, as well as is its landscaping efforts. In addition to Florida and Texas, the disease has been found in the Caribbean, West Africa, Tanzania, and Mexico.

Cadang-cadang is another serious disease that was reported in the Philippines in the early part of the 1900s. It is estimated to have killed more than 30 million trees in that time. It has recently been reported on the island of Guam.

The disease produces symptoms on mature palms of leaf mottling and gradual reduction in fruit size and production. Death follows a very long decline in the health of the palm. It has been found to infect coconuts (*Cocos nucifera*), oil palm (*Elaeis guineensis*) and buri palm (*Corypha elata*).

The causal agent is a viroid, but its exact method of transmission has not been determined. Recent research indicates that this disease may be seed transmitted, and there is presently no control.

Foliar decay of coconuts has been documented in Vanuatu. It appears that the local Vanuatu coconut cultivars are tolerant of or resistant to this disease. However, all introduced coconut varieties tolerant of lethal yellowing (Malayan dwarf types) are highly susceptible to foliar decay. In particular, foliar decay is fatal to any Malayan red dwarf cultivar.

The causal agent has not been identified, although it is assumed to be a virus. It appears that the virus has a wide host range and is transmitted from native vegetation to any introduced palms. A sucking plant bug, the cixiid bug (*Myndus taffini*), which is very similar to the plant hopper responsible for lethal yellowing has been

found to spread the disease. No means of control has been found for this disease, other than the unexplained natural resistance found in Vanuatu palms.

Fatal wilt disease of palms has been documented in South India, Malaysia, and Sri Lanka. Little is known of the causal agents, and investigations are being done as rapidly as possible, but the disease is spreading in these areas.

Red ring disease has been found to be associated with a nematode (*Rhadinaphelenchus cocophilus*) and has caused serious losses of coconuts in the Caribbean.

Sudden wilt of coconut has been described on coconut and oil palms in several South American countries. It is theorized that this disease, which is starting to become epidemic, is related to the presence of a flagellated protozoan (*Phytomaona staheli*).

The threat of these potentially devastating diseases points out the importance of strict adherence to plant quarantine regulations. There are valid reasons they should be obeyed. Please do your part to protect our environment and economy, no matter how much trouble you think it is!

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Maintaining Landscape Plants

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Pruning

Pruning is the removal of unwanted growth from plants. It should be done as a part of a scheduled maintenance program. Waiting until plants are overgrown creates additional problems. Depending on the kind of plant involved, certain times of the year are better than others for pruning.

When to prune

Trees and shrubs may be *lightly* pruned year-round in Hawaii. Remove dead, broken, or diseased branches whenever they appear. Plants grown for foliage, such as podocarpus, privet, juniper, and yaupon holly may be pruned at any time, because flowering is not why we grow these plants. However, the timing of pruning plants grown for their flowers or fruits is very important. Pruning affects future flower development, and should be

timed to maximize blossoming.

The right time to prune depends on the plant, its condition, and the results desired. For rapid shoot development and the greatest overall growth, plants should be pruned just before the vegetative buds begin to swell. To retard growth with the maximum dwarfing effect, plants should be pruned after each flush of growth, when the new leaves are fully expanded. If a species flushes several times a year, pruning in late summer may encourage an additional flush of shoot growth.

Plants flower from either current growth (the ends of twigs and branches), or older wood (further back on branches). Plants that flower on current growth (new shoots and stems) usually blossom and form fruits several times a year, sometimes almost continually in Hawaii. Such species include allamanda, oleander, hibiscus, and bougainvillea. Prune them periodically throughout the year after a blooming flush to encourage new shoot development. Take care to prune lightly. Continuously heading-back this type of plant (for example, a hibiscus hedge) results in dense foliage and few flowers.

Plants that flower on older wood generally flower and fruit at a distinct time once each year. To maximize flowering on plants that flower on older wood, prune immediately at the end of their blooming cycle. Pruning or pinching shoots at this time encourages more lateral branches and many more flowers. Pruning later in the season removes flower buds and reduces subsequent flowering and fruiting. Plants of this type include some azaleas and hydrangeas, camellias, magnolias, Indian hawthorn, crape myrtle, royal poinciana, jacaranda, cassia, and bottlebrush.

Deciduous plants (such as monkeypod), which drop their leaves before flushing, are best pruned late in the dormant (bare) cycle. Plants that do not lose their leaves are best pruned several weeks following a growth flush. At this time, wounds caused by pruning rapidly develop callus and close, which discourages insects, diseases, and decay from entering the plant. Undesirable sprouting may result from pruning at other times. When trees produce excessive sprouts, they are easily damaged when pruned during active shoot elongation. The worst time to prune is when leaves are forming. *Do not prune plants when they are under stress.*

Some plants grown in Hawaii have specific pruning needs. Pikake blooms on new growth but flowers most heavily from March to September. Prune pikake between November and January. For heavier flower set, they may also be cut back once or twice during the flowering period. New flowers will be produced about four

weeks after this pruning. Mango should be pruned after fruiting, before a growth flush begins. Fruit trees should not be pruned once flowering begins. Pruning of fruit trees should be timed to suit the flowering season of the specific cultivar.

For best pruning results, learn about the species and cultivar of the tree or shrub and decide what you would like from the plant in the landscape. To realize your goals, consult some of the many resources available, such as garden centers, libraries, garden books, Internet web sites, and Cooperative Extension Service offices, for specific information on recommended pruning times.

Pruning is done to

- maintain the health of plants by removing dead, weak or damaged wood
- remove branches that rub and wound other limbs
- remove weak and crowded stems
- renew old shrubs by removing old stems and branches
- minimize wind damage
- prune top growth to balance a reduced root system at transplanting
- develop shape and size
- develop a full or open canopy
- produce specialized growth (hedges)
- increase or decrease flowering and/or fruiting
- maintain views and trafficways

Pruning alters the balance between roots and shoots and temporarily changes the plant's growth patterns. Removing a portion of the top may cause a flush of new shoots (Palms are an exception). Similarly the same thing happens when roots are cut - new feeder roots develop rapidly.

In most plants, active growth of the terminal bud suppresses the growth of the buds below, this is called apical dominance. By removing this terminal bud, the lower buds are allowed to grow resulting in increased branching. By cutting back the side branches, terminal growth will increase. In this way plant growth can be directed by pruning.

There are several types of pruning in general use.

Heading back involves the selective cutting of the ends of twigs, or branches to an axillary (side) bud or node. This produces a denser shrub. If possible, cuts should be made so they are hidden by foliage.

Thinning is the selective removal of branches to their origin, or to a lateral branch. Remove to a lateral branch so that growth is in the desired direction. Thinning gives a plant an open, natural appearance.

Pinching involves regular hand pruning of tender new growth in order to maintain a constant size and to influence the direction of growth.

Shearing uses hand or power trimmers to maintain a formal shape in hedges and topiaries.

"Hatracking" is when all branches of a tree or shrub are shortened without taking care to cut to a bud or side branch, an excessive number of weak new branches will be formed. The dense head catches the wind and can make trees liable to storm damage. Any professional landscaper would definitely not recommend this type of pruning.

All pruning tends to produce either a formal or an informal result, depending on the type of pruning and the tools used. Formal pruning is usually accomplished by using shears or by pruning to approximately the same location on the plant each time, such as in hedging, pollarding and the development of topiary characters like those found in theme parks. Informal pruning can produce a softer look to plants and is obtained by an individual cut approach, rather than a sweeping movement with power shears. By pruning individual branches, stems, or shoots below the general outline of the plant, a reduction in size and shape can be produced without providing a "hard" or formal look.

Some rules for correct pruning

- Use good quality tools that are suitable for the job at hand.
- Make sure the tools are properly sharpened and maintained.
- When cutting out all diseased, dead and weak growth, always prune back to healthy wood, free from infected tissue.
- Hard pruning usually stimulates the production of new shoots and is useful where leafy growth is required. Light pruning stimulates bud development.
- Too little pruning is safer than too much. When in doubt, don't.
- All cuts must be clean. Remove any ragged edges left from saw cuts.
- Collect all clippings and dispose of them properly.

Weed control

Because of the increasing use of fertilizers and irrigation, and the demand for better appearing properties, weeds are becoming more of a problem in the landscape. There are several methods of removing or controlling weeds, any of which pose problems if not properly practiced. Specific weed control materials are readily available and can be very effective. However, disaster

results when carelessness or a lack of knowledge of the product and procedures causes expensive damage and destruction.

Weeds compete for water and nutrients with landscape plants, in addition to making the planter beds look uncared for. The secret to successful weed control is to get them before they mature and flower.

Chemical controls are considered by some to be the best method for removing weeds. This can be misleading, and a thorough understanding of the limitations of such materials is needed to avoid trouble. It is not always possible to treat weeds with chemicals while still giving adequate protection to desirable plants. The roots may be intermingled, and some ornamental plants are highly susceptible to the actions of herbicides.

On the other hand, the wise and timely use of such handy chemical controls can often make the difference between success and failure—and profit and loss—on a maintenance project. There are suitable herbicides for many situations, but they always should be used only in strict accordance with their label directions. Knowing the differences between selective and nonselective herbicides and how to use them properly is essential.

Sometimes labels can be misleading if plant growth is not clearly understood. For example, some popular herbicides advise the user not to apply the material within the drip line of the plant. However, most plants have root systems that far exceed the drip line, and a valuable tree or shrub can be lost if the herbicide makes contact with even a few roots.

Mechanical controls, such as cultivation, hand removal and repeated cutting (mowing), can effectively control many weed problems. Hand weeding or scuffling the soil surface (but not to a depth that harms the roots of the landscape plants) is still effective for small weed infestations or to kill newly germinated seedlings. While not as easy in some cases as herbicide applications, the immediate effect and the lasting quality of this method can be an advantage. As with the use of chemicals, caution must be used when certain tools, such as string type equipment, are employed. More and more damage is observed because of the misuse of these otherwise efficient aids. It is not the fault of the tool when such misuse causes expensive damage to trees and shrubs. A mulch area around free-standing trees will prevent such damage.

Cultural controls can be among the most effective means of weed control or prevention. Often, common-sense methods such as correct fertilization and watering, proper mowing height, use of mulches, and the right selection of grasses and groundcovers will prove as ef-

fective as any other method.

Mulching is an excellent weapon against weeds. The mulch will kill off existing weeds, making it difficult for seedlings to become established on its dry upper surface, and the loose mulch makes it very easy to pull any weeds that do grow.

The use of mulches on ornamental plant areas has additional advantages. Loose mulch covers the moist soil surface, reduces evaporation, and insulates the soil surface from the direct rays and heat of the sun. It also provides a steady supply of micronutrients and low levels of nitrogen, which promotes steady, healthy growth of ornamentals. Heavy organic mulches are often helpful in controlling nematodes by promoting the growth of fungi which actually trap and feed on the nematodes.

Fertilization of shrubs and trees

Fertilization of shrubs and trees can be very simple. Unless plantings are young, the aim of fertilization should be to keep the plants healthy, green, and growing slowly. Two to three applications per year of 12-12-12 applied at the rate of 1 pound nitrogen per 1000 square feet of root area are sufficient. If the plants are small, the rate can be increased and the analysis changed to one that is higher in nitrogen, 18-4-8 for example. Apply the fertilizer over an area of ground that is twice the area of the dripline.

Fruit trees will benefit from extra fertilization (four or five times per year), with more potassium in relation to the nitrogen, and from extra micronutrients. Fertilizers for fruit trees ("citrus special") meet these needs. Plants referred to as "acid loving plants" such as azaleas, gardenia, and ixora will benefit from extra iron and manganese. Palms and cycads have a high requirement for manganese, and many also benefit from extra magnesium. These elements can be supplemented by adding manganese sulfate or magnesium sulfate (Epsom salts) to the regular fertilizer, or by using a "palm special."

For additional information, refer to the CTAHR publications *Pruning trees and shrubs*, *Mulching for healthier landscape plants*, and *Fertilizers for trees and shrubs* (see p. 18 for information on obtaining these).

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Copper-Impregnated Pots May Solve Several Nursery Problems

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In the last issue we reported on the use of latex paint containing copper hydroxide to prevent plant roots from encircling the root ball of container-grown plants. The commercial name of this product is Spin Out™. Copper is released from the latex coating on the inner surface of the container into the potting medium near the container wall. When the root tips come in contact with the copper, they become stunted, reportedly encouraging roots to grow laterally from other areas and resulting in a fibrous root system that does not encircle the outer surface of the root ball.

A new technology has been developed by Nursery Supplies Inc. of Chambersburg, PA. This new product is a line of polyethylene pots that have the copper salt compound incorporated into the container wall. These containers, called Root Right™, have recently been tested by researchers at the University of Rhode Island and found to be as effective as latex copper paint in preventing encircling root growth. Their study included coniferous trees, evergreen shrubs, perennials, and annuals. The Root Right containers reportedly release about one-third the amount of copper and still maintain an equal level of root growth control. This may be of more importance for annuals where copper toxicity may be a critical issue, especially if it is used in plug trays. An additional advantage of the Root Right containers is that they maintain their effectiveness far longer and can be reused several times with little reduction in activity.

Recent reports from local nurserymen indicate that these copper-impregnated products may have additional advantages in retarding weed growth in the pots, as well as discouraging snails from entering.

Root Right containers have recently received EPA approval. According to Henry Guarriello Jr., project manager for Nursery Supplies, Inc., the new product will be available in the Spring of 1999, and the company will customize container size based on each order.

A similar root-control system is manufactured by Texel USA Inc. This particular system consists of polypropylene sheets, called Tex-R Inserts™, which are coated on one side with 6 g/m² of copper from Spin Out™. These sheets are used as liners in pot-in-pot production, or under propagation trays, to prevent the emergence of roots through the drainage holes, which re-directs the growth to the developing roots.

About Research

Eileen Herring
Hamilton Library, UH Manoa

Alstroemeria 'Las Olas' PPAF, a semi-dwarf, tetraploid hybrid selection for hot climates.

A.W. Meerow and F. Meyer. 1998. HortScience 33(4): 758-759.

Alstroemeria 'Las Olas' PPAF is a semi-dwarf, cutflower quality, hybrid selection which flowers from April to July in south Florida. Unlike most of the commercial *Alstroemeria* cultivars, 'Las Olas' has remarkable heat tolerance. The plants are about 2 feet tall and produce 3 to 17 flowers on each stem. The flowers are red-purple (*RHS Colour Chart* 73B-74D) with a central white zone with red-purple (*RHS Colour Chart* 59A) spots. It can be grown easily in USDA Hardiness Zones 9-11 under an open roofed structure with up to 50% shade. Divisions having at least six vegetative stems will produce good yields in the first season with subsequent yields reaching 43 stems per square meter. Because the plant is semi-dwarf, it is also suitable for container and landscape plant production. The Florida Agricultural Experiment Station has applied for a U.S. Patent on *Alstroemeria* 'Las Olas'. Licensing arrangements will be handled by the Florida Foundation Seed Producers, Inc., Box 309, Greenwood, FL 32433.

Root and shoot growth patterns in four palm species and their relationships with air and soil temperature.

T.K. Broschat. 1998. HortScience 33(6):995-998

Roots and shoots of plants often grow at different times of the year and at different rates in response to environmental factors such as air and soil temperature. Understanding how roots and shoots respond to external conditions may increase transplanting success. Four species of landscape palms were used in this study: royal palms (*Roystonea regia*), coconut palms (*Cocos nucifera* 'Malayan Dwarf'), queen palms (*Syagrus romanzoffiana*), and pygmy date palms (*Phoenix roebelenii*). During the two-year study period, the roots and shoots of all four species grew throughout the year, but the growth rate varied in response to temperature. Only the pygmy date palm shoots did not grow faster at higher air and soil temperatures. The roots of these four palm species were alive and functional throughout the study. Under conditions similar to those in south Florida, root and shoot growth in these palm species should occur throughout the year. There were no obvious times of

year when palms should not be transplanted due to root inactivity. Root growth rates were reduced during cooler weather, but transpiration is also lower under such conditions so this should not adversely impact transplant success.

Greenhouse conditioning affects landscape performance of bedding plants.

J.G. Latimer and R.D. Oetting. 1998. *Journal of Environmental Horticulture* 16(3):138–142.

Cultural practices and/or chemical growth regulators are commonly used during greenhouse production to control bedding plant height. The ultimate goal is to control plant growth and condition the plant to tolerate the stresses of shipping, marketing, and landscape establishment. The carryover effects of these practices on landscape performance are seldom examined even though landscape performance effects customer satisfaction. The objective of this research was to evaluate the effect of individual cultural or chemical methods of growth regulation on greenhouse growth and landscape performance. The treatments included: two fertilization rates, two irrigation treatments, two plant growth regulators, and mechanical conditioning. The two water soluble fertilizer treatments were 50 ppm nitrogen three times per week (Low N) and 500 ppm nitrogen three times per week (High N). The two irrigation treatments were ebb-and-flow irrigation and drought stress to wilt point for 2 hours. Chemical growth regulator treatments were single applications of 500 ppm B-Nine (daminozide) or of 45 ppm Bonzi (paclobutrazol). Mechanical conditioning was applied by brushing the top one-third of the plants with a wooden bar for 40 strokes twice a day. These treatments were applied to columbine (*Aquilegia x hybrida* 'McKana Giants'), New Guinea impatiens (*Impatiens x hybrida* 'Agadoo'), marigold (*Tagetes erecta* 'Little Devil Mix'), and ageratum (*Ageratum houstonianum* 'Blue Puffs'). In all four species, the plants in the Low N treatment required more time to reach acceptable size or quality. On the other hand, only the New Guinea impatiens had improved performance with the High N treatment. Drought stress reduced the quality of marigold and ebb-and-flow irrigation produced very succulent plants susceptible to transplant shock. Mechanical conditioning reduced height and the reduction did not persist in the landscape, but the brushing often produced unacceptable levels of damage to leaves and flowers. The B-Nine application produced moderately shorter plants without adverse impact on landscape performance in columbine and marigold; the treatment was

ineffective on New Guinea impatiens and persisted after planting in ageratum. The Bonzi application caused persistent excessive height reduction in New Guinea impatiens. Conditioning treatments such as drought or low nitrogen which produce physiological stress had the greatest negative impact on subsequent landscape performance. Rates of chemical plant growth regulators (PGRs) must be carefully selected to avoid persistent growth reduction in the landscape. Management of cultural conditions to produce healthy vigorous bedding plants in the greenhouse provides the best plants for optimum landscape performance.

Effects of ethrel and gibberellin on impatiens plants.

G. Tamari, L. Pappa, T. Zered and A. Borochoy. 1998. *Scientia Horticulturae* 76:29–35.

In many locations, impatiens (*Impatiens balsamina*) flowers year round and maintaining stock plant quality for cutting production requires techniques to inhibit flowering without adversely effecting the number, length or rooting capacity of the cutting material. In this study, combined treatments of ethrel and gibberellin were applied to two impatiens cultivars—'Tempo Pink' and 'Aruba'—in winter and in spring to see if the cutting quality of the stock plants would be improved. Ethrel was applied at a variety of concentrations ranging from 200 to 800 ppm and gibberellin was applied at 25 ppm. The treatments were made as canopy sprays in the afternoon. In the ethrel treatments for both cultivars, the number of cuttings increased as the concentration increased with double the crop at the highest concentration (800 ppm). However, the cuttings from the ethrel treated plants were shorter than those from the untreated plants. Addition of the gibberellin treatment increased the length of the harvested cuttings without increasing the number of flowers. Bi-weekly treatments of ethrel combined with gibberellin produce good quality, non-flowering impatiens stock plants. Cuttings should not be harvested in the 3 days following the treatments since large amounts of ethylene are produced during that period and this might be detrimental to the post-harvest quality of the cuttings.

Sustainability of organic fertilization of macadamia with macadamia husk-manure compost.

H.C. Bittenbender, N.V. Hue, K. Fleming, and H. Brown. 1998. *Communications in Soil Science and Plant Analysis* 29(3-4):409–419.

In a four year experiment, macadamia husk-manure compost was evaluated as an fertilizer for macadamia pro-

duction. The treatments that were compared were: 1) a combination of solid and liquid chemical fertilizers applied based on leaf and soil analysis; 2) macadamia husk-cattle manure compost applied annually at 8,800 pounds per acre between July and October; and, 3) compost plus mineral fertilizers applied based on leaf and soil analysis. The compost was made of 62% macadamia husk, 31% cattle manure, 6% top soil and 1% crushed coral by weight; this mixture was composted and cured for about four months. The manure compost produced yields comparable to those produced by chemical fertilizers. However, the application costs were about 10 times that of chemical fertilizers because the chemical fertilizers were applied by airplane while the compost had to be broadcast with a tractor-drawn fertilizer spreader. Compost is a good slow release fertilizer and a valuable resource, particularly for organic farming. In large-scale operations, however, compost application costs are much higher than those of chemical fertilizers. Small farms without access to bulk-priced fertilizers and airplane application methods may find costs for producing or purchasing compost competitive with chemical fertilizers without adverse effects on yield.

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Number	Title
L-1	Selecting a tree care professional
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II-20	Chemical weed control recommendations for turfgrasses in Hawaii
IP-2	Bougainvillea looper
PD-12	Banana bunchy top virus
PA-4(A)	Papaya ringspot virus (PRV): a serious disease of papaya

Determining When to Water Lawns

David Hensley and Jay Deputy
Department of Horticulture

Watering is one of the most often abused and least understood aspects of turfgrass culture. Improper watering is wasteful, costly, and damaging to the grass and landscape. As Hawaii continues to grow and develop, water use for turf and landscape plantings will become more and more restricted. Our water use must be more efficient and follow the principles of good water management.

Determine when water is needed

The worst possible irrigation program is to water turf daily for 5–10 minutes. Unfortunately, this is the most common method used by homeowners and many professionals. Light, daily irrigations encourage shallow rooting, thereby reducing the amount of soil the turf has available for water storage. The grass depends on the daily drink and wilts or browns very quickly if it does not receive it. Brief daily irrigation encourages disease problems, weed invasion, accumulation of thatch, and soil compaction. Shallow rooted turf is also more prone to traffic injury.

A newly seeded or planted lawn is the exception to the rule of deep watering. For the first few weeks after planting, water frequently and lightly to encourage seed germination or good growth of stolons or sprigs. As the lawn becomes established, water less frequently and for longer periods.

There is no single irrigation schedule that will meet the need of every landscape. Timing of waterings depends on the site, soil type, management practices (mowing and fertilizer application), season of year, and type of turf. An efficient and economical way to irrigate a lawn is to apply water at the first signs of water stress. Research has shown that turf watered at the first signs of visual wilt used 33% less water. Waiting too long, however, can cause browning or permanent damage. The initial signs of stress may include the following:

- Color changes, and bluish-gray areas can be seen in the lawn.
- Footprints or tire tracks remain in the grass for several hours after they are made.
- Many leaf blades are rolled or folded in half.
- A soil sample from the root zone feels dry.

Soil moisture sensors can be used to determine water stress. A *tensiometer* measures the moisture in the soil and can be used to schedule irrigation according to how

much water remains in the soil. By monitoring the turf and the tensiometer, the soil moisture level at which wilting and drought stress symptoms appear can be determined. This will be relatively constant, regardless of season. By irrigating just before the symptoms would have become evident, water is applied only when it is needed. Research has shown that tensiometer-scheduled irrigation used half as much water as a rigid schedule. An easy method to calibrate an automatic irrigation system is simply to turn off the irrigation system and note the number of days required for stress signs to show in the turf. Adjust the timer to irrigate one day before stress symptoms appear. For example, if wilting and stress is evident after four days without water, set the system to water every three days. The time for stress symptoms to appear will vary with exposure to wind and sun. Evaluate and set the timer for different irrigation zones individually, and allow for seasonal variations.

The best time of day to water a lawn is early morning, when the wind is less likely to alter distribution patterns, evaporation is minimal, disease development is minimized, and water pressure is usually greater. Watering during the heat of the day wastes water because evaporation rates are very high. Watering in the evening results in water staying on the grass all night, encouraging the spread of fungal diseases. Avoid watering in the evening.

Determine how much water should be applied

The amount of water absorbed at any one time varies with the amount of water present in the soil, the water-holding capacity of the soil, and the soil's drainage characteristics. An efficient irrigation wets only the root zone, does not saturate the soil, and does not allow water to run off.

A simple irrigation schedule would be to apply 3/4–1 inch of water at the first visual signs of wilt. Typically, this will require two or three waterings per week during summer and fall. Watering too much reduces root growth and increases disease problems for turf and landscape plants.

To determine the application rate of the irrigation system, measure the amount of water applied by placing several straight-sided cans in the sprinkler pattern. Run the system for 15 minutes and measure the depth of the water in each can. Calculate the amount of water the system applied in one hour by multiplying the measurement by 4. The uniformity of the coverage can also be determined in this manner.



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*Thank you.* We hope you've enjoyed this issue of *Landscape, Floriculture, and Ornamentals News*.

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