GROWING PALMS

Horticultural and practical advice for the enthusiast

Edited by Randy Moore

Contents

Leaning Crown Syndrome

A serious yet unexplained malady of palms is gaining wider attention in California and elsewhere. First recognized at least 25 years ago, I call it Leaning Crown Syndrome (LCS) because affected palms lose their geotropic response, their crowns of leaves leaning and growing horizontally before, in severe cases, actually growing back down toward the ground. Such abnormal and bizarre growth detracts greatly from the palm's esthetic and commercial value and, in the most severe cases, results in death. There is no documented cause or remedy for this condition.

Although first seen on *Howea forsteriana* (kentia palm), I have observed LCS or similar symptoms on *Archontophoenix cunninghamiana* (king palm), *Phoenix dactylifera* (date palm), *P. reclinata* (Senegal date palm), *Syagrus romanzoffiana* (queen palm), and *Trachycarpus fortunei* (Chinese windmill palm). Others have reported observing it on additional species.

1. *Howea forsteriana* showing moderate to severe symptoms of LCS.

The first symptoms of LCS are abnormal petioles, which tend to bend or curve in the same direction, pushing the leaf blades toward one side of the palm (Figs. 1, 2). If the condition persists, the center growing point (center bud or apical meristem) will gradually change orientation from a near vertical to horizontal and eventually downward alignment. The process can takes months or even years.

In LCS-afflicted kentia palms, at least, pinnae are set much more closely on the rachis and are a darker green than those of unaffected palms. In LCS-afflicted king palms, nodes or leaf scars tend to be slanted rather than horizontal, as if one side of the trunk is growing vertically faster than the adjacent opposite side, thus forcing the palm to bend or lean. In kentia palms, however, slanted leaf scars are probably not a reliable indicator of LCS because even normal palms have leaf scars in a variety of alignments. In some instances with LCS-afflicted kentia palms the apical growth appears to have expanded upwards very quickly, giving the impression it might be unusually weak and thus prone to bending (Fig. 2).

Twice, in 1985 and 2001, I cut down LCS-afflicted kentia palms and took the center bud and adjacent tissues to the University of California at Riverside for analysis by the soil and plant tissue lab and the departments of entomology and plant pathology. Analyses showed that there were no abnormal levels of any elements in the palm tissue, and there were no diseases or insect or mite pests present.

Chapin and Ooka reported LCS or a similar condition on *Pritchardia pacifica* in Hawaii; although they were unable to identify a causal agent (*Palms* 47:107–109. 2003.). The same or a similar condition in Florida has been attributed to boron deficiency (T. Broschat and A. Meerow, *Ornamental Palm Horticulture*. 2000.), yet soils in California typically have more than adequate levels of this element. Also, with kentia palms in California, which are commonly found in the landscape as multiples because they were grown as such in the nursery, it is only one plant out of a group of several that is affected by LCS even though it is obvious that the roots of all individuals in the group are intertwined.

Darley and co-workers reported that a condition similar to LCS affected *Phoenix dactylifera* 'Barhee' (now known as "Barhee Bending"), although they also were unable to determine its cause (Date Growers' Inst. Ann. Rep 37: 10–11. 1960; Date Growers' Inst. Ann. Rep. 41: 15. 1964). Yost, a date grower in California, later reported that he corrected Barhee Bending by rearranging the heavy infructescences to hang on the opposite side of the trunk from the bend (Date Growers' Inst. Ann. Rep. 45: 2. 1968.).

Several collectors have purportedly "cured" their LCS-afflicted kentia palms by drenching the center bud with a copper-based fungicide or by removing all the leaves and cutting down horizontally through the crown area to expose the center bud. However, these undocumented and unverified procedures are not the result of a controlled, replicated study so their efficacy is somewhat dubious. Indeed, in some instances, LCS-afflicted palms have, after a while, resumed normal growth.

According to kentia palm seed producers on Lord Howe Island, where the palm is endemic, LCS has not been observed or recorded. Strangely, though, kentia palms seed producers not too far away on Norfolk Island, where kentia palms have been planted by the 1000s for seed production, have reported that LCS occasionally occurs. On Norfolk Island, seed producers treat LCS-afflicted palms by applying direct, opposing, physical pressure or tension to the bud area. Typically, they attach a strong rope to the leaning or bending crown or center bud area of a LCS-afflicted palm, pull the rope taut to apply sufficient pressure to the crown or bud, and tie the rope off to secure object, such as a building, sturdy post, or other palm. They

2. *Howea forsteriana* showing the bending and leaning of the apical bud area typical of LCS.

retie or readjust the rope periodically to maintain fairly strong pressure or tension on the leaning crown or bud.

On kentia palms I have observed a bud rot, perhaps pink rot caused by the fungus *Gliocladium*, followed by an insect infestation distorting the new emerging growth in such a manner that it began to lean very slightly to one side in a way somewhat similar to LCS. I arrested this condition, though, by applying a fungicide and an insecticide and, perhaps most importantly, providing proper culture, such as irrigation, nutrition and mulching.

Multiple causes for LCS are a distinct possibility. Perhaps viruses or virus-like agents or even genetic instability should be considered. I urge anyone observing or having experience with LCS or similar conditions to contact me. I would like to devise an appropriate research strategy to determine the cause of and solution for this serious malady. – *Donald R. Hodel, University of California, Cooperative Extension, 4800 E. Cesar Chavez Ave., Los Angeles, CA 90022, USA, drhodel@ucdavis.edu.*

Palm Horticulture in the Rose Hills Foundation Conservatory for Botanical Science, Part I

In a strict sense, the conceptual beginnings of the Rose Hills Foundation Conservatory for Botanical Science at the Huntington Botanical Gardens in San Marino, California date to the early 1990s. However, the historical impetus for this ambitious project goes back to the early part of the 20th Century. At that time, Henry E. Huntington built a grand lath house whose design inspired the current modern-yet-classical building (Fig. 1). This precursor was located very near the site of the present structure but was demolished about 50 years ago. With ties to the past and a view toward the future, the Conservatory complements the institution's many historic buildings.

The Conservatory belongs to an inclusive Botanical Center that encompasses the Children's Garden, Nursery and Botanical offices. Combined with the new Chinese Garden, these works represent over 20 years of planning and the cultivation of generous support from a wide range of donors. They are the first major Botanical Division building projects at The Huntington in over 60 years.

1. The south façade of the recently constructed Rose Hills Foundation Conservatory for Botanical Science at the Huntington Botanical Gardens.

With three distinct environments – tropical rainforest, cloud forest and carnivorous plant bog, as well as a living plant science lab – this unique resource functions as an interactive science center for children and families. Exhibits are designed to engage youngsters (emphasis on ages 9–12) in hands-on experiments using scientific instruments and living plants to explore the natural world around them. The facility serves to support a program of botanical science education and helps develop and sustain the living collections. Beyond this core mission, many visitors simply enjoy observing beautiful and unfamiliar plants in a rarified setting and leaving with fond memories.

The overall area of this steel and glass building is 1,500 sq. meters. Of this area, only one-third is devoted to planting space. At first this seems like a generous allowance for walkways and other hardscape features, but this ratio has worked out well. Palms are concentrated in the Rotunda (tropical rainforest) section (Fig. 2). This room features relatively small beds along the upper deck, too small for most palms, while the main section is sunken below this level and houses most of our larger specimens. Varying topography is one of the best features of this area. From the lowest point to the roof of the dome is about 13 m.

Climate

Climate control for the Conservatory is concentrated in a circular plenum running beneath the main walkway of the Rotunda section. In our mild Mediterranean climate, heating is not a significant challenge and is handled by two 1-million BTU units, one acting as back-up. Cooling is more complex and depends primarily on a system of underground tunnels that carry air cooled by armatures of fog nozzles inside the tunnels (i.e., cooling by evaporative transpiration). In addition, overhead manifolds generate large quantities of fog in all galleries and help both to cool and humidify. The cooling system is well suited to our warm, dry climate but loses much of its effectiveness during occasional hot, humid weather.

Almost all of the palms in the Conservatory are planted in the Rotunda, and the following figures relate to this gallery only (the remaining three galleries all experience cooler night temperatures). In winter, the nighttime low temperature (heating set-point) is about 18ºC/65ºF, with a high of about 24ºC/75ºF by day. This daytime high figure for winter reflects ambient solar input during fair weather; daytime heating set-point is 20ºC/68ºF. Humidity in winter is 70–75% by day and around 80% at night. Over the summer, the night-time low temperature gradually increases to about 21ºC/70ºF, usually without any supplemental heating, even though outdoor temps in our area stay below 21ºC/70ºF except for the few very hot and humid days of the year. During

2. The interior of the Rotunda section of the Conservatory that exhibits a tropical rainforest environment with an emphasis on palms.

the daytime in summer, highs are kept to about 27–29ºC/80–85ºF but can climb to around 32ºC/90ºF during hot spells, when outdoors it may be over 43ºC/110ºF. Humidity at night in the summer is about 90% and dips to about 80% during the day. With set-points agreeing closely between winter and summer there is no great need for autumn and spring climate templates, and these may be omitted eventually. Since the building was planted in late summer 2005, we have made constant, incremental adjustments every few weeks or months, and the frequency of these has diminished over time.

In general, it may be that the climate conditions outlined above are slightly too cool on average for some tropical plants, including certain palms (to be covered in Part II: "The Palms"). Obviously slower growth results from cooler conditions, and whether some palms can maintain healthy and vigorous slower growth is as yet unknown. While warmer, muggy nights would doubtless be a boon to many low elevation tropical species in the Rotunda, such conditions would also encourage most insect pests and some diseases. This effect is consistently demonstrated in our two tropical greenhouses, one kept under intermediate conditions and the other under warm conditions (as per orchid culture).

Soil Mix

Some of the considerations in developing our soil mix were as follows: longevity, porosity (drainage), neutral to slightly acid pH, and aesthetics. Some aspects of choosing a planting mix that in hindsight should have received more attention were settling (solution: a lower % of fir bark and/or fuller beds), cation exchange capacity (solution: addition of some clay and/or silt) and hydrophobic properties (solution: add a wetting agent). The mix used throughout the Conservatory for all terrestrial plants is as follows:

40% 0-1/4 inch (1 cm) fir bark
20% #20 silica sand
10% 5/16 inch (0.8 cm) scoria
10% 3/16 inch (0.5 cm) scoria
8% charcoal (from coconut shell)
7% coarse peat
5% Turface®

Incorporated into each cubic yard (765 liters or 0.76 cubic meters) of this mix were the following additives:

0.9 kg (2 lbs) Micro-Max
2.7 kg (6 lbs) Nutricote® 16-6-8
1.8 kg (4 lbs) dolomite
1.8 kg (4 lbs) Nitriform
0.9 kg (2 lbs) triple super phosphate
0.5 kg (1 lb) potassium nitrate
0.2 kg (0.5 lb) iron sulfate

All of these ingredients were gathered together and mixed by A1 Soils in San Diego, a division of Hanson Aggregates. Price varied between US$135.00 and $180.00 per cubic yard, depending on the load size.

Irrigation

Aspects of water quality and application of water to planted areas are among our greatest ongoing challenges. Upon its implementation we realized that the cooling system described above would use essentially all of the reverse osmosis (RO) water produced and stored, at least during hot weather. The actual constraint is RO water storage rather than production, making the solution fairly simple conceptually. In the meantime we are using city water, which normally varies from 250 to 350 ppm tds (higher in summer), the main salts being sodium and calcium.

The application of water is limited by a system that is similarly undersized for the scope of the project. A network of twin quick-couplers throughout the Conservatory, each pair consisting of one city water connection and one RO water connection, is used to attach hoses and hand-water, or set-up hose-end sprinklers. As it is not possible or desirable to water all plantings throughout the building at once, calculating frequency of watering is only approximate. Most areas are watered once every three or four days in winter and every two or three days in summer. Ideally, all watering is performed in the early evening or late afternoon, but schedule considerations and public hours dictate that most watering occurs during mid-morning. (Incidentally, in the greenhouses, plants are routinely left wet overnight and this "natural" condition has not caused any disease problems). Plans are underway to develop a simple irrigation system that will run manually or automatically and employ various "mini sprinkler" technologies. This system would operate in conjunction with continued hand-watering in certain areas.

Problems under this arrangement are what might be expected, including inadequate saturation (especially where the medium has dried out and become hydrophobic), water spotting on foliage and eventual cumulative salt build-up in the root zone. A few palms have exhibited salt tip burn but most have adapted well to current conditions. A further issue that is very important, even in our mild climate, is tempered or warmed water. Ground temperature of our city water ranges from about 16ºC/60ºF in winter to 21ºC/69ºF in summer. Warming this range up by about 10ºC/20ºF would doubtless have a positive and noticeable impact on most plants, especially palms.

Fertilization

The initial mix of additives detailed above was depleted after about ten months. Supplemental fertilizing has consisted mainly of top dressings of Nutricote® 18-6-8 and liquid injector feeding with GrowMore® hydroponic 5-11-26 with micronutrients, at about 160 ppm N. Most irrigation occurs without fertilizer, however, due to time constraints and the difficulties of having our volunteers fertilize. Much of the Conservatory watering chores are performed by our volunteer corps. A good incentive for us to use the hydroponic formula frequently at the recommended application rate is that this fertilizer drops the pH of our city water from around 8 to around 7. Occasional applications of Mycor Palm Saver™ (6-3-6 with endomycorrhizal package and micronutrients) and calcium nitrate (CaN) have also been used. Rates used for all of these products were toward the low end of manufacturers' recommendations and probably too low for heavy feeders, including many of the palms. It is worth experimenting with different formulations and methods of application, and we are continuing this process on an informal basis. In particular, the use of fertilizers with N mostly in the form of nitrate nitrogen (with only a small percentage of ammoniacal or urea nitrogen) makes a notable difference in growth and flowering in certain plants (amaryllids, orchids, etc.) and presumably provides better nitrogen nutrition for many other plants also. A comprehensive baseline analysis (structural, chemical, microbial) of our in situ planting mix after continued use of this fertilization program is currently under way.

We have used top dressing fertilizers high in nitrogen to supplement our usual low nitrogen liquid fertilizer (5-11-26). The latter is effective in producing more compact, disease-resistant growth that never looks lush, but for palms and some other plants the top dressing fertilizers and occasional feeding with CaN are helpful in maintaining vigor and good color. A few years ago I learned from an agricultural advisor that most plants (except turf and bedding annuals) benefit from a formulation with potassium and phosphorus *twice* the level of nitrogen, with potassium even a little higher. In effect this means that common formulations with, say, a 20-20-20 ratio may provide proportionately excess nitrogen. This approach has worked well for almost all of our tropical plants, though some commercial growers will probably want to accelerate growth with different ratios. – *Dylan P. Hannon, Curator of Conservatory and Tropical Collections, Huntington Botanical Gardens, San Marino, California USA*