GROWING PALMS

Horticultural and practical advice for the enthusiast

Edited by Randal J. Moore

Contents

Recycled Water Quality and Palms: Part II

Essential nutrients must be in a water-soluble form in order to be available for uptake by the palm's root system. The nutrients may be present in sufficient amounts in the soil but still not available to the palm. For many nutrients, one of the important factors for determining their availability is the pH of the soil and irrigation water.

While somewhat variable depending on the sample time and location, the pH of most recycled irrigation water is moderately alkaline (a pH range of 8.0–8.5). Many soils are also somewhat alkaline, including those in Southern California where this study was undertaken. In general, most palms perform best in a neutral pH range of 6.0–8.0. Certain acid-loving palms prefer a pH of less than 7.0 to as low as 5.5.

The principal effect of a high or low pH in the soil and irrigation water is the relative availability of essential nutrients. The availability of most metals and phosphorus is reduced at high pH (alkaline) conditions. In low pH (acidic) conditions, potassium, phosphorus, sulfur, calcium and magnesium are less available.

Optimal pH ranges have been established that indicate when the availability of the particular nutrient is maximized. There is also partial solubility that gradually declines as pH deviates from the optimal range. The degree of partial solubility outside of the optimal range differs depending on the particular element. Each nutrient that is important in palm horticulture is discussed below with regard to pH availability and recycled water quality.

Nitrogen. The relative availability of nitrogen is maximized for a range of neutral pH values from 6.0 (slightly acidic) to 8.0 (slightly alkaline). Nitrogen is not retained in acidic soils (particularly potting mixes) and is rapidly leached away causing a deficiency.

Of course, Nitrogen is an essential macronutrient that is scarce in some soils and container-grown palms. Nitrogen deficiency causes yellowing of leaves and a reduction in the palm's growth rate. Because recycled water tends to be moderately alkaline, it can reduce the availability of nitrogen to palms.

Phosphorus. A relatively narrow pH range of 6.5 (very slightly acidic) to 7.5 (very slightly alkaline) is optimal for the uptake of phosphorus. As the pH varies from this optimal range, the availability of phosphorus to plants tends to decline rapidly.

Although phosphorus leaches quickly through most soils and is available over a narrow pH range, it is rarely a cause of nutrient deficiency in palms. Most balanced fertilizers contain copious amounts of phosphorus to meet most palms' growing requirements.

Potassium. The availability of potassium to plants is good over a very wide range of pH from 6.0 (slightly acidic) to 10.0 (strongly alkaline). Its availability is only decreased under moderately and strongly acidic conditions. While generally not related to pH, potassium deficiency is fairly widespread in palms. This is normally due to this element's absence in soils. It is not retained well in many types of soil because of leaching.

Sulfur. Similar to potassium, sulfur is highly available over a pH range of 6.0–10.0 and is only suboptimal in very acidic conditions. Sulfur is rapidly leached from most soils. However, it is usually replenished by additional decaying organic matter. It is an important macronutrient needed by palms in fairly large quantities. A deficiency of sulfur generally causes necrotic conditions in the new leaves of palms.

Sulfur decreases the pH of most soils. It is important in reducing the higher pH associated with recycled water. Its deficiency is treated by the application of any sulfur-based fertilizers. Applying sulfur will also make other essential nutrients available that are otherwise non-soluble under highly alkaline conditions.

Magnesium and Calcium. The assumed pH range for maximum availability of magnesium and calcium is 7.0 (very slightly alkaline) to 8.5 (moderately alkaline). The explanation for this optimal range is somewhat complicated. Magnesium and calcium are actually more available at an acidic pH. However, their necessary presence in the soil causes the soil to be more alkaline. Acidic soils can be neutralized by the addition of dolomite (a combination of magnesium and calcium). Therefore, the solubility of these two elements is more commonly related to higher levels of pH. The alkalinity of recycled water, in addition to alkaline soil conditions, can inhibit the availability of these minerals.

Magnesium is well-known as an important mineral nutrient for palms. It is often deficient in sandy soils where it has been easily leached from the soil. While not fatal, the symptoms are commonly yellowing leaf margins. Simply fertilizing with magnesium may not solve a deficiency problem. It may be quickly leached from a sandy soil. Also, there is a proper balance of potassium and magnesium that must be maintained for a deficiency to be prevented. Finally, the soil or irrigation water or both can lead to overly alkaline conditions that inhibit solubility.

Iron. The best pH range for availability of the element Iron is from 4.0 (strongly acidic) to 6.0 (slightly acidic). Its solubility tapers off gradually as the pH of soil becomes more alkaline. While iron deficiency is somewhat common in palms, and iron generally present in the soil, this condition is generally not due to high pH soil or water. The early symptoms usually appear as chlorosis on the new leaves. The common cause of the deficiency is poorly aerated soils.

Manganese. A pH range of 5.0 (strongly acidic) to 6.5 (slightly acidic) is optimal for the solubility of manganese. The availability of manganese declines quickly as the pH of the soil or irrigation water become more alkaline. A main cause of manganese deficiency is high pH soil or water. The use of relatively-high pH recycled water to irrigate palms can introduce this deficiency problem.

Boron. Boron is most available over a pH range of 5.0 (strongly acidic) to 7.0 (very slightly alkaline). However, it is generally available over the entire pH spectrum. Therefore, the use of recycled water would not be a cause of boron deficiency. The problem is normally introduced by a lack of the element since it is readily leached in most types of soil.

Copper and Zinc. Similar to boron, the elements copper and zinc are soluble over the same pH range of 5.0–7.0. However, unlike boron, these elements are not easily taken up in high pH conditions. The solubility of copper and zinc is comparable to that of other metals such as iron and manganese. At high levels of absorption, these metals can become toxic. For this reason, the best soil and irrigation water pH is within the neutral range. Because recycled water is moderately alkaline, it can inhibit the uptake of these elements.

Molybdenum. The availability of molybdenum is greatest over the pH range of 7.0 (very slightly alkaline) to 10.0 (strongly alkaline). Little is understood about the causes of molybdenum

deficiency. The use of recycled water does not appear to present a problem with respect to this element.

A final note on the use of recycled water when irrigating ornamental palms. The irrigation system should meet the government health protection guidelines. In the State of California (Introduction to Health Effects Study, Richard Carlson, San Diego County Department of Environmental Health, presentation to San Diego County Water Authority, 1998). Recycled water is not considered safe to drink, wash hands or inhale (in mist) because of low levels of coliform bacteria. Some of the requirements are: All recycled water valves, pipes and outlets are to be appropriately tagged and color-coded (light purple). Access to valves and outlets must be restricted. Public notice must be posted that recycled water is being used. Irrigation methods should minimize ponding, runoff and overspray. Irrigation should be done at a time of day when it will have a good opportunity to dry before contact is made with the public or animals. *– Randal J. Moore, Poway, California, USA and Michael Marika, Park Arborist, City of San Diego, California, USA*

Additional Resources

Broschat T.K & A.W. Meerow. 2000. Ornamental Palm Horticulture. The University Press of Florida.

Shaw D.A. and D.R. Pittenger. s.d. Recycled Water Quality, unpublished white paper. University of California Cooperative Extension.

Using the "World Checklist of Palms" in the Garden

I ordered the *World Checklist of Palms* (Govaerts, R. & J. Dransfield. 2005. Kew Publications, ISBN 1-84246-084-6. 235 pp), hereafter abbreviated *WCP*, after hearing about its publication from John Dransfield during a board meeting of the International Palm Society at Montgomery Botanical Center nearly four years ago. At first, it seemed that a book listing all of the accepted names of palms might be of little use to a palm hobbyist. It also seemed like the book would have a short shelf life since the taxonomists are constantly making changes. Instead, for several reasons, it has become one of the most useful books in my library. Rarely does it sit on the shelf for long, as I so frequently refer to it. I use it whenever I am updating the database of my palm collection, placing a permanent plant sign in the garden or tagging the palms in my nursery. I also often reference it when I am talking about palms with a fellow collector either in person or on-line.

My main use of the *WCP* is to determine the correct spelling of a palm's name. The names are listed alphabetically by genus and then species. At the time of its publication in 2005, there were 2,364 species in 190 genera. The simple format makes it possible to quickly obtain a correct spelling. For instance, even many taxonomists could not correctly spell a name like *Cryosophila warscewiczii* without some reference.

The *WCP* contains the list of all validly and effectively published names according to the monocot checklist database maintained at the Royal Botanic Gardens, Kew. Usually, this is valuable in determining legitimately recognized species when visiting a palm garden or nursery. The *WCP* is also a listing of accepted names, i.e., those accepted by most palm taxonomists. However, there is some disagreement within the taxonomy community regarding some palm species, and the *WCP* is only one authoritative resource among several.

Following each entry of an accepted name are the associated synonyms (of both the genus and the species) listed chronologically. I find this useful for updating the outdated names in my collection. The taxonomy of any collection is continually changing and the *WCP* is a resource for keeping it current.

Recognized natural hybrids are also included in the *WCP*. An "×" marker is placed before the name to indicate a hybrid. A palm from Florida was given to me as "*Copernicia sueroa.*" I did

not believe this was a legitimate species. After referring the *WCP*, I found that the correctly spelled name is *Copernicia* × *sueroana,* and it is a hybrid of *C. hospita* and *C. rigida*.

If I want to learn more about *Copernicia* × *sueroana*, or any other palm listed in *WCP*, the author is cited along with the place and date of publication. Many palm species were originally published in *Principes/PALMS* making it easy to research if you maintain a personal library. The IPS has also made progress toward publishing an on-line library of *Principes/PALMS* back issues on its website.

The geographic distribution of each listed species is also provided. The information is regional for widely distributed species but may specify states or provinces for more narrowly confined species. Complications are noted, such as questionable distributions, extinct species, naturalized exotics, etc. I find this useful because my plant signs in the garden include the geographic distribution.

The *World Checklist of Palms* can be ordered on-line at www.kewbooks.com, the website for ordering publication of the Royal Botanic Gardens, Kew. The price is £17.00 plus shipping charge (varies depending on location). The book order is processed in Pounds Sterling and is billed to customers in the currency of their credit card. Overseas orders are sent by airmail.

An on-line *World Checklist of Monocotyledons* is maintained by the Royal Botanic Gardens, Kew and can be accessed at http://apps.kew.org/wcsp/home.do at no charge. This database provides the most current taxonomic information on the palm family (and other monocots). The information on a specific species can be searched by entering the full or partial scientific name using the wildcard character (*). – *Randal J. Moore, Poway, California, USA*