ORNAMENTAL PALM PROPAGATION AND CONTAINER PRODUCTION

HENRY DONSELMAN[1]

Rancho Soledad Nurseries, Inc.
18539 Aliso Canyon Road, P.O. Box 1689
Rancho Santa Fe, California 92067

Palms are playing an ever increasing role in the overall sales of retail and wholesale nurseries. In warmer climates these plants provide a tropical feel to the landscape. As interior plants many palms are unsurpassed for their durability and low light requirements. Many of the more common landscape palms are being recognized for their drought tolerance—a factor that is becoming more important in urban areas with water shortages.

Palms are arborescent or shrubby monocots. Related plants in this monocot group are plant families such as the bamboos and grasses, bananas, strelitzeas, aroids, and lilies. In addition to their ornamental value, palms are very important economically in the world. Coconut and African oil palms are widely grown for their tropical oils and other food products. Date palms are grown for their production of the edible date fruit. Many new palm plantations have recently been established in tropical areas for the production of hearts of palms, a gourmet delicacy.

Nursery production of palms generally falls into two categories. Field production of balled and burlaped palms (or boxed palms) for the landscape, and container shade production of interior palms. A few large interior palms may start out as field-produced plants and, likewise, some landscape palms are strictly container-grown, but these are generally exceptions to the standard practice.

PROPAGATION OF PALMS

The primary method for propagating most palms is by seed, even though advances in tissue culture techniques have made it possible to asexually propagate a few important palm species (8, 9). Germination of palm seed can require from several weeks to over a year (3) and methods of accelerating palm seed germination have been investigated. Presoaking seeds in gibberellic acid (GA) is known to accelerate germination of Macarthur palm (*Ptychosperma macarthurii* (H. Wendl.) Nichols), Alexandra palm (*Archontophoenix alexandrae* (F.J. Muell.) H. Wendl and Drude), and areca palm (*Chrysalidocarpus lutescens* H. Wendl.) (5, 6, 7),

[1] Vice-President and Director of Research

but in the case of areca palm, GA presoaking caused excessive elongation of seedlings and resulted in unattractive plants. Cleaning or removal of fruit pericarp also improved germination percentage and decreased germination time of areca palm seed (1).

Seed quality, as affected by fruit maturity at harvest and postharvest handling, can greatly affect germination percentage of palm seeds. Areca palm seed picked green germinated very poorly if cleaned, but almost as well as mature seed if not cleaned (1). Improper storage of areca palm seed prior to planting also greatly decreased germination percentage (1).

Fruit maturity at harvest has a significant effect on time required for germination of some palm seeds, but may not always affect final germination percentage. Seed presoaking generally hastens germination time and final germination percentage. Cleaning queen palm seeds greatly improves final germination percentage. With this palm, the highest germination percentage was obtained when cleaned mature green or half-ripe seeds were used. This contrasts with results obtained for areca palms where cleaned ripe or half-ripe seeds had the highest germination percentage and required the least time for germination. The fact that ripe queen palm seeds germinated more slowly and that very few uncleaned seeds germinated suggests the presence of a germination inhibitor in the pericarp of ripe fruit.

As a general rule, one should plant fresh, fully mature seed. The maturity of palm seed can be determined in most cases by a softening of the fleshy fruit surrounding the seed and an associated color change of the fruit (green to red, etc.). Although there are exceptions, as noted above, fresh, mature seed requires less germination time and seedlings emerge more uniformly.

Although the best way to obtain fresh seed is to collect it yourself, this is not always feasible. When obtaining seed from commercial seed sources always request freshly harvested seed. If improperly stored, palm seed can lose its viability in just a few weeks. If the seed has been stored, ask what method was used. The following storage method will often extend the viability of palm seed to one year or longer (1).

Storing Palm Seed. Cleaned palm seeds are spread out in shallow containers and conditioned for two days at 85 to 90% relative humidity. A greenhouse or propagation house generally provides this humidity. The seeds are dusted with a seed-protectant fungicide (such as thiram), tightly sealed in heavy polyethylene bags, and stored at 23 $\pm$ 1 °C (73 °F). This method is different from the storage of most seeds in two ways. Usually seeds are dried and then stored under cool, dry, refrigerated temperatures. Palms require just the opposite; high humidity and warm temperatures.

Since this environment can encourage fungal growth it is important that a seed-protectant be used.

Germinating Palm Seed. Once good, clean seed is obtained it should be soaked in water for one to two days. Some propagators will add a wide spectrum fungicide to the water. Some also add insecticides. For large numbers of seed a wooden frame is usually constructed of exterior plywood. Dimensions will vary depending on the number of seed. The depth should be about 30 cm (12 in.). Good drainage is necessary.

A loosely fit piece of black plastic should be placed in the bottom of the bed. This will prevent the seedlings from rooting deeply into the soil and thus make pulling them for transplanting much easier. The frame should be filled about 4/5 full of the germination medium. Tests have shown that a medium composed of sphagnum peat and perlite in a 1:1 ratio gives the best results (4). Avoid using topsoil or other components that may introduce insects or disease organisms into the germination bed.

The soaked seed is placed in a single layer on the prepared bed. Depending on the size of the seed, an additional 1.3 cm (1/2 in.) to 2.5 cm (1 in.) of medium is placed over the seeds. Water-in the seeds thoroughly and then cover the bed with clear plastic. You can staple the plastic to one side of the frame and then attach the other end to a long wooden stake. This will allow you to rollup the plastic to water the bed and pull seedlings. It may also be necessary to roll up the plastic slightly to allow some of the heat build-up to escape. If rodents are a problem you may have to attach hardware cloth to the top of the germination bed. If you are germinating smaller amounts of seed you can use a deep container to hold the seed. Avoid shallow flats because it is very difficult to keep the medium watered properly.

Temperature, to a large degree, determines how fast and how even the seeds will germinate. Try to maintain the temperature between 29° and 35° C (85 to 95° F). At 21° C (70° F) *Chamaedorea seifrizii* required over 12 months to germinate while at 29° C (85° F) this same seed source germinated in four months. Similar results were found for queen palms.

The endosperm of most palm seed provides enough nutrients for the seedling until 2 to 3 juvenile leaves have been produced. At this time the seedlings are generally transplanted. If fertilization is required before transplanting, apply a weekly liquid fertilizer application at 200 ppm nitrogen of a soluble fertilizer with a 3:1:2 ratio. Resin-coated granular fertilizers with the same nutrient ratio have also been used successfully.

Container Soils for Palms. One of the most important factors in the successful production of container palms is the soil (less) medium used. This must hold the water, provide the nutrients, and support the plant. Most basic horticulture courses teach the fundamentals of plant physiology and give us a pretty good understanding of a plant's root system. But what is often forgotten, and extremely important to nurserymen producing container-grown plants, is the effect the growing medium has on the root system and how this information can be used to maximize plant survival and growth.

All ''soiless'' mixes for interiorscape palms require the addition of certain nutrients to insure proper plant growth and maintenance. Dolomitic limestone (dolomite) is a combination of calcium and magnesium carbonate and often the sole source of magnesium (Mg), a macronutrient required by plants, particularly palms. While many feel the addition of dolomite is necessary for pH reasons, it is far more important as a source of Mg. Container soils require about 8 lbs of dolomite per cubic yard. A finely pulverized material that is 12 to 20% Mg is recommended.

Micronutrients are also incorporated into palm soil mixes. Research has shown that the sulfate forms of micronutrients remain available to plants for over 18 months (2). A material such as Micromax (Sierra Chemicals) should be incorporated at a rate of 1½ lbs. per cubic yard.

Many ''textbook'' soil recipes include superphosphate in container mixes. Their reasoning is that since phosphorus is important in the growth of new roots it should be a component of the soil mix. Unfortunately, this recommendation is not based on research results, particularly with palms. Superphosphate ties-up certain micronutrients and can lead to serious deficiencies.

The medium used must be water retentive yet well drained. The fairly unaggressive root system of most palms, in addition to the length of time they must exist in the same container, requires a soil resistant to degradation by the interactive effects of nitrogen fertilizers and microbial action.

A good mix consists of 25% (by volume) small bark pieces (graded to about ¼ to ½ in. sizes), 25% coarse sand (such as trap sand), 30% Canadian peat, and 20% scoria. Horticultural grade perlite can be substituted for the scoria—but avoid styrofoam soil amendments.

It is important that the Canadian peat be the coarse ''chunky'' grade. For each cubic yard of this material incorporate 8 lbs of dolomite (for magnesium) and 1½ lbs of Micromax (Sierra Chemical). **No** superphosphate should be incorporated into the mix.

Another ''recipe'' that excludes the sand, makıng the mix physically lighter but still very good for ınterior palms ıs:

1 part scoria (or perlite): 1 part bark· 2 part sphagnum peat

Example:

1/2 cu. yd. scoria (or perlite).
1/2 cu. yd. bark (1/4 in.)
1 cu. yd. coarse sphagnum peat (fluffed)
16 lbs dolomite lime
3 lbs Micromax

This makes two cu.yds. of the mix. Note that 1 cu.yd. of sphagnum peat is equivalent to about 7½ cubic feet of **compressed** peat. Peat is usually purchased in 4 or 5 cubic feet (compressed) bales. This mix will work well with all interior plants, is very well drained, and difficult to overwater.

Most palm seedlings are transplanted directly to 10 cm. (4 in.) or 15 cm. (6 in.) containers. The fairly fragile root system should be handled with care. Planting depth is critical. Planting seedlings too deeply (for seedling stability) is a common mistake that can lead to many problems. Establishment of young palms requires a structure that provides 55 to 63% shade. After 2 to 3 months the young plants can be moved to their final growing destination. Interiorscape palms require 63 to 73% shade while landscape palms should be grown in full sun.

Palm Fertilization. There are two methods of fertilization commonly used in palm productıon. In southern California or other arid areas it is probably preferable to liquid feed using a fertilizer ınjector durıng every irrigation. Use a fertılizer with a 3:1:2 ratio of N, P, and K. Irrigate with 200 parts per mıllion (ppm) N three times a week.

In areas with more rainfall and subsequent leaching, notably Florida and Hawaıı, it ıs probably better to use a slow release (resin-coated) fertilizer with the same 3:1:2 ratio. Studies in Florida indicate that the most efficient method of applying resın-coated fertilizers is a modified type of dibbling. First, in these tests a small amount of soil (2.5 cm (1 in.) or more, depending on the container size) was placed in the container. The fertılizer charge was then broadcast evenly on the soil. The palm being transplanted was put into the container at the proper depth and the container filled with soıl. This method of fertilization almost eliminates soil degradation from bacterial breakdown.

The only step left ın growing container palms is to transplant them to larger containers as they grow. Most palms require transplanting

every 12 to 18 months. If the palms are being transplanted to a field nursery they should be set-out as established plants in at least 15 cm (6 in.) containers. The best time to plant them in the field is in the spring or early summer. This allows them to develop an established root system before the cooler winter months. Fertilization in a field nursery can be liquid fed through the irrigation system, or by top-dressing around the young palms with granular fertilizers. The preferred ratio of N, P, and K are 2:1:2 (such as a 10-5-10), but a good high grade turf fertilizer will also work. Liquid and granular fertilizers that contain micronutrients should be used. It may be necessary to supply magnesium in the form of magnesium sulfate (Epsom salts) as a top dressing to the palms.

Growing quality palms is easy if you follow the above recommendations. Just remember, start with fresh, cleaned seed, a good soil mix, and the proper nutrients.

LITERATURE CITED

1. Broschat, T.K. and H. Donselman. 1986. Factors affecting storage and germination of *Chrysalidocarpus lutescens* seeds. *Jour. Amer. Soc. Hort. Sci.* 111:875-877.

2. Broschat, T.K. and H. Donselman. 1985. Extractable Mg, Fe, Mn, Zn, and Cu from a peat-based container medium. *Jour. Amer. Soc. Hort. Sci.* 110:196-200.

3. Deleon, N. 1958. Viability of palm seed. *Principes* 2:96-98.

4. Donselman, H. 1982. Palm seed germination studies. *Proc. Fla. State Hort. Soc.* 95:256-57.

5. Nagao, M.A. and W.S. Sakai. 1979. Effects of growth regulators on seed germination of *Archontophoenix alexandrae*. *HortScience* 14:182-183.

6. Nagao, M.A., K. Kanegawa, and W.S. Sakai. 1980. Accelerating palm seed germination with gibberellic acid, scarification, and bottom heat. *HortScience* 15:200-201.

7. Schmidt, L. and F.D. Rauch. 1982. Effects of presoaking seed of *Chrysalidocarpus lutescens* in water and gibberellic acid. *Foliage Digest* 5(12):4-5.

8. Startisky, G. 1970. Tissue culture of the oil palm (*Elaeis guineensis* Jacq.) as a tool for its vegetative propagation. *Euphytica* 19:288-292.

9. Tisserat, B. 1979. Propagation of date palm (*Phoenix dactylifera* L.) in vitro. *Jour. Exp. Bot.* 30:1275-1283.