Effect of Sand Backfill on Transplanted Palms

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I. Introduction

Increasingly important components of landscapes in California, ornamental palms are emblematic signature plants of Mediterranean landscapes worldwide. Although only one palm is native to California, homeowners and green industry professionals employ a multitude of ornamental palms when designing and installing new landscapes. Palms impart that so-sought-after exotic and dramatic theme to the landscape and offer installation and maintenance benefits and advantages that few other plants can provide. Indeed, there is a resurging interest in palms as specimens and accents or to add height, dimension, and architectural interest for homes, businesses, parks, and other public areas, and the last 20 years have seen a dramatic increase in the number and kinds of palms available for landscapes in California.

Although nursery growers are producing more palms than ever, demand still exceeds supply for many species in many size categories. Sales of palms at the retail level are strong as homeowners seek to create a Mediterranean or tropical theme for their home landscapes. Landscape architects and designers are specifying more palms in their landscape plans. Landscape contractors and maintenance firms are installing and maintaining more palms than ever. Also, demand for low-water use plants is rising in California, and recent research has shown that many landscape palm species used here are appropriate for low-water use landscapes (10).

Because of their unique root and trunk morphology, large specimen palms can be transplanted with a relatively small root ball, creating an instant, mature landscape. From homeowners to architects and designers, to nursery growers and those who install and maintain landscapes, there is strong demand for practical, research-based information about appropriate transplanting and planting techniques to ensure successful and rapid establishment of transplanted palms. Homeowner inquiries, consultations with clientele, and surveys at educational seminars document the strong demand for this specific information. Homeowners and professionals need timely, practical, research-based information to make informed and accurate decisions about the appropriate transplanting and planting of ornamental landscape palms.

A common and standard industry practice is to use builder's or washed plaster sand as the sole backfill medium. Its use purportedly enhances anchorage and stability and improves aeration and drainage. While there is recent information (1-9) on several aspects of planting/transplanting palms, including time of year, root ball size, pre-plant storage, backfill amended with organic matter, mulching, and leaf removal and tie up, there is no research-based information or recommendations on using sand as the backfill medium when transplanting palms. Thus, there is a clearly identified need to develop research-based information about this practice.

The information derived from this study will assist homeowners and commercial landscape managers, helping them save money, resources, and time, and improve success in transplanting specimen landscape palms.

II. Materials and Methods

We designed and implemented this 18-month project at the University of California South Coast Research and Extension Center, Irvine (UC SCREC). Ten established specimens each of *Archontophoenix cunninghamiana* (king palm), *Syagrus romanzoffiana* (queen palm), and *Trachycarpus fortunei* (Chinese windmill palm) existing at the Center were dug May 20-23, 2008 with root balls extending out from the trunk for 30 cm (12 inches) (Fig. 1). The palms were replanted a short distance away in an adjacent field in 120 × 120 × 120-cm (48 × 48 × 48-inch) holes, using either builder's sand or native site soil as the backfill medium (Fig. 2). The experimental design was a randomized complete block with two treatments (builder's sand and native site soil) and five, single-tree replications of each treatment. Micro sprayers were used for irrigation with scheduling set at 80% of real time ETo. Ronstar pre-emergent herbicide was applied as per label rate. Growth parameters, including color, wilt, and number of new leaves, were recorded 1, 6, and 12 months after transplanting. Survival was recorded 12 months after transplanting. All data will be recorded again at the end of the project (18 months after transplanting). Data was subjected to ANOVA and other statistical evaluation.

III. Results

Twelve months after transplanting there were mostly no statistically significant differences in growth parameters between the backfill treatments (sand or native site soil) in the three species of palms (Tables 2-4) although there was a strong trend with king and windmill palms for the sand backfill to enhance color, reduce wilt, and increase leaf production (Figs. 3-4). Indeed, windmill palms planted with sand backfill produced more than twice as many new leaves as those planted in native site soil, the only significant difference among the growth parameters thus far. Perhaps the final data collection at the end of the project 18 months after transplanting in December 2009 will show more significant differences.

However, the trend for enhanced growth with the sand backfill with king and windmill palms is clearly evident in survival. All palms with the sand backfill survived while 80% of the king palms and 20% of the windmill palms with the soil backfill died (Table 5).

Table 1. Qualitative rating scale for color and wilt for three palm species, UC SCREC, Irvine, CA, 2008-2009.

Rating	Color	Wilt
0	0% green	0% wilt
1	20% green	20% wilt
2	40% green	40% wilt
3	60% green	60% wilt
4	80% green	80% wilt
5	100% green	100% wilt

Table 2. Qualitative color rating for three palm species 12 months after backfilling with either sand or soil, UC SCREC, Irvine, CA, 2008-2009. Rating scale was 0=no green color, 5=100% green (Table 1). Means with same letter within a column are not significantly different at $P<0.05$.

	Species		
Treatment	Queen	King	Windmill
Sand	3.2 a	2.6 a	3.4 a
Soil	3.2 a	1.2 a	2.7 a
P-value	1.00	0.11	0.14

Table 3. Qualitative wilt rating for three palm species 12 months after backfilling with either sand or soil, UC SCREC, Irvine, CA, 2008-2009. Rating scale was 0=no wilt, 5=100% wilt (Table 1). Means with same letter within a column are not significantly different at *P*<0.05.

	Species		
Treatment	Queen	King	Windmill
Sand	0 a	1.4 a	0.2 a
Soil	0 a	3.4 a	2.2 a
P-value	1.00	0.10	0.10

Table 4. Number of new leaves for three palm species 12 months after backfilling with either sand or soil, UC SCREC, Irvine, CA, 2008-2009. Species*treatment interaction was significant (*P*<0.05). Means with same letter are not significantly different at *P*<0.05.

Palm species	Treatment	No. New Leaves
Queen	Sand	1.8 b
	Soil	1.6 b
King	Sand	2.8 b
	Soil	1.2 b
Windmill	Sand	6.4 a
	Soil	3.0 b
P-value		0.03

Table 5. Percent survival for three palm species 12 months after backfilling with either sand or soil, UC SCREC, Irvine, CA, 2008-2009. Species*treatment interaction was significant (*P*<0.05). Means with same letter are not significantly different at *P*<0.05; n=30.

Palm species	Treatment	Survival
Queen	Sand	100% a
	Soil	100% a
King	Sand	100% a
	Soil	20% b
Windmill	Sand	100% a
	Soil	60% ab
P-value		0.03

III. Conclusions

These preliminary results suggest that sand backfill may improve transplant success for some species of palms. With king and windmill palms sand backfill enhanced color, reduced wilt, increased leaf production, and improved survival. In contrast, sand backfill was not beneficial when transplanting queen palms.

We are unsure why sand backfill is beneficial when transplanting some species of palms. Perhaps the sand provides optimal moisture and aeration for regeneration of new roots from cut roots in those species showing enhanced growth and survival. Sand backfill may provide other benefits as well. Because sand packs more easily and uniformly due to its varying particle sizes and has a high bulk density, it may improve support and stability of large and/or tall specimens. Because of its uniformly coarse texture and well draining properties, sand backfill may simplify irrigation in some instances, especially those with heavy native site soils, by making irrigation slightly less exacting: excess water would drain easily and readily away from the root ball. However, this excess water, if in sufficiently large quantity, might eventually have to be removed from the planting hole to preclude it from collecting and rising to a level that would inundate part or the entire root ball.

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Figure 1. Established specimens, as here with Chinese windmill palm, were dug with root balls extending out from the trunk for 30 cm (12 inches) (Photo © Copyright 2008 by D. R. Hodel).

Figure 2. The palms were replanted using builder's sand, as here with king palm, or native site soil as the backfill medium (Photo © Copyright 2008 by D. R. Hodel).

Figure 3. Transplanted king palm performed much better with builder's sand as the backfill medium (Photo © Copyright 2008 by D. R. Hodel).

Figure 4. Transplanted king palm performed poorly with native site soil as the backfill medium (Photo © Copyright 2008 by D. R. Hodel).