

Effect of Leaf Tie and Pre-Plant Storage on Transplanted Mexican Fan Palms

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Abstract

Medium sized (over 2m) Mexican fan palms were transplanted after field digging, transport and delivery from a palm nursery. Palms were planted with their leaves tied or untied or held in storage for variable times and after delivery. Post delivery storage or leaf tie up did not effect survival or growth one year after planting. Transpiration was increased in palms whose leaves were tied and in palms that were stored on site after delivery.

Index Words

Transpiration; *Washingtonia robusta* H. Wendl.

Significance to the Nursery Industry

Large specimen palms are in high demand in many Western states. Due to the size of these plants, they are field grown in nurseries and then dug, and transported directly to the landscape site for planting. Leaf tying is necessary to prevent damage during transport, however, if palms could be untied at the time of planting this would save money and increase the appearance of the installed landscape without the expense of later untying the palms. Nurseries frequently give instructions on planting and after care of palms, yet the effects of leaf tying and onsite storage have not yet been detailed in a research study.

Introduction

Palms are readily transplanted to provide instant landscapes of high visual impact. A standard industry practice (SIP) while transplanting palms is to remove some leaves and tie up the remaining ones during digging, transport to the planting site, planting, and the post-planting establishment period. The ties are allowed to deteriorate and fall away on their own and/or are thrust off by the emerging new growth. Leaf removal and tie up, while esthetically unpleasing, are performed to reduce transpirational water loss (Hodel et al. 2003 and in prep.), and are thought to be critical because roots lost or damaged during transplanting are unable to take up water or do so at much reduced amounts. Leaf tie up purportedly protects the center bud and remaining leaves during digging, transport, and planting. However, Hodel et al. (2006) demonstrated that leaf tie up did not increase survival or establishment of Mexican fan palms dug and immediately replanted.

It is best to plant palms immediately after delivery, and their root balls, backfill, and surrounding soil should be kept moist for successful establishment (Broschat and Meerow 2000, Pittenger et al. 2005). However, palms are frequently stored for several

days or even weeks at a new job site until they can be planted. In such cases, the root ball is often unprotected and exposed to the drying effects of sun and wind, a situation potentially deleterious to survival and successful establishment.

The objective of this study was to determine the effect of pre-plant storage and leaf tie up on transplanted large specimens of Mexican fan palms that have been delivered from a distant nursery site.

Materials and Methods

Thirty Mexican fan palms (*Washingtonia robusta* H. Wendl.) with two to three meters of clear trunk were purchased from a commercial grower in Indio in the low or Colorado desert area of southern California. The grower delivered the palms with all leaves tied up to the study site at the University of California South Coast Research and Extension Center in Irvine, California on July 22, 2004.

Ten palms were planted on the delivery day (July 22, 2004), five palms remained tied up and the other five were untied. The pre-plant storage periods were three and seven days after delivery. Thus, on July 25 and 28, 2004 we repeated the process, planting 10 palms on each of the days, five with the leaves tied up and five with the leaves untied. The palms arrived at the study site laid down and stacked with their root balls unprotected on a large flatbed trailer. Digging and loading at the nursery, jostling and bouncing during transport, and/or unloading caused the loss of much soil from the root balls of several specimens, leaving them in a bare-root condition with many damaged and dried roots. We included these palms with those for immediate planting and those with less damage or more intact root balls were held for later planting in the pre-plant storage treatments.

During the pre-plant storage period we placed the unplanted palms in full sun on bare soil with their root balls uncovered and unprotected, and applied no water. Weather data during the pre-plant storage period was obtained from the California Irrigation Management Information System (CIMIS) on-site station (Table 1) and is available on-line (<http://www.cimis.water.ca.gov/cimis/frontStationDetailData.do?stationId=75>).

We untied the leaves on February 1, 2005 because the twine the grower used had not deteriorated after seven months and the palms were producing new leaves.

The study site soil has a San Emigdio sandy loam with the following chemical and physical properties: pH 7.0; cation exchange capacity of 14.4 meq/100g; electrical conductivity ($\text{dS}\cdot\text{m}^{-1}$) 0.80; total N 0.05%; K (saturation paste) 27 ppm; P (Olsen) 5 ppm; Mg (meq/L) 1.6; sand, 68%; silt 19%; clay 13%; and organic matter, 0.84%.

Immediately after planting, and one and two months later, we measured transpiration with a Licor 1600 autoporometer (Licor Instruments, Lincoln NB). Three readings were recorded from the youngest, fully expanded leaf from each palm and averaged. We recorded the number of brown, green, and new leaves at six months and the number of new leaves and petiole lengths at one year after transplanting.

The experimental design was a two factor (planting date and leaf tie up) randomized complete block. There were five replications of each set of treatments. We conducted analysis of variance tests (ANOVA) and compared means using Fischer's Protected Least Significant Difference Test ($LSD_{0.05}$). Statistical analyses and comparisons were made with Minitab® Statistical Software (v.13.32; Minitab, Inc., State College, PA, U.S.A.).

Results and Discussion

All palms of all treatments and planting dates survived and established. Leaf tie up had no effect on the number of brown, green, or new leaves produced six months after transplanting (Table 2) or new leaves produced or petiole length 12 months after transplanting (Table 3).

Pre-plant storage had little effect on leaf production or petiole length 6 or 12 months after transplanting (Tables 2 and 3). The only effect was observed in the number of green leaves six months after transplanting where palms stored for three days actually had more green leaves than those planted immediately after delivery to the study site (Table 2). This difference may be the result of our selection of palms with the most damaged root balls and dry roots for immediate planting after delivery. These palms were more severely stressed and did not establish as quickly as those palms with more intact root balls, which were held for later planting.

Leaf transpiration rates differed only on September 7, 2004, about six weeks after transplanting and immediately after the onset of very high temperatures, when tied-up leaves transpired significantly more than untied leaves (Figure 1a). Pre-plant storage did not significantly affect transpiration rates except also on September 7 when leaves on those palms stored for seven days transpired more than leaves on palms planted immediately after delivery (Figure 1b).

Our findings corroborate those of Hodel et al. (2006) in that leaf tie up is unnecessary for establishment of transplanted large Mexican fan palms. Even when these palms are stored in full sun with their root balls unprotected, without irrigation for up to a week, leaf tie up is unnecessary once the palms are planted.

We recommend that leaves on transplanted Mexican fan palms remain tied until planting, at which time the ties can be removed to improve esthetic quality. While Mexican fan palms can endure limited pre-plant storage without protection or water for their root balls if leaves remain tied, we are hesitant to endorse pre-plant storage as a common accepted practice.

Literature Cited

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Figure 1a Effect of leaf tie up on transpiration rates ($\text{g}\cdot\text{cm}^{-2}\cdot\text{s}^{-1}$), large *Washingtonia robusta* palms transplant study, South Coast Research and Extension Center, Irvine California, July-November, 2004.

Figure 1b. Effect of pre-plant storage on transpiration rates ($\text{g}\cdot\text{cm}^{-2}\cdot\text{s}^{-1}$), large *Washingtonia robusta* palms transplant study, South Coast Research and Extension Center, Irvine California, July-November, 2004.

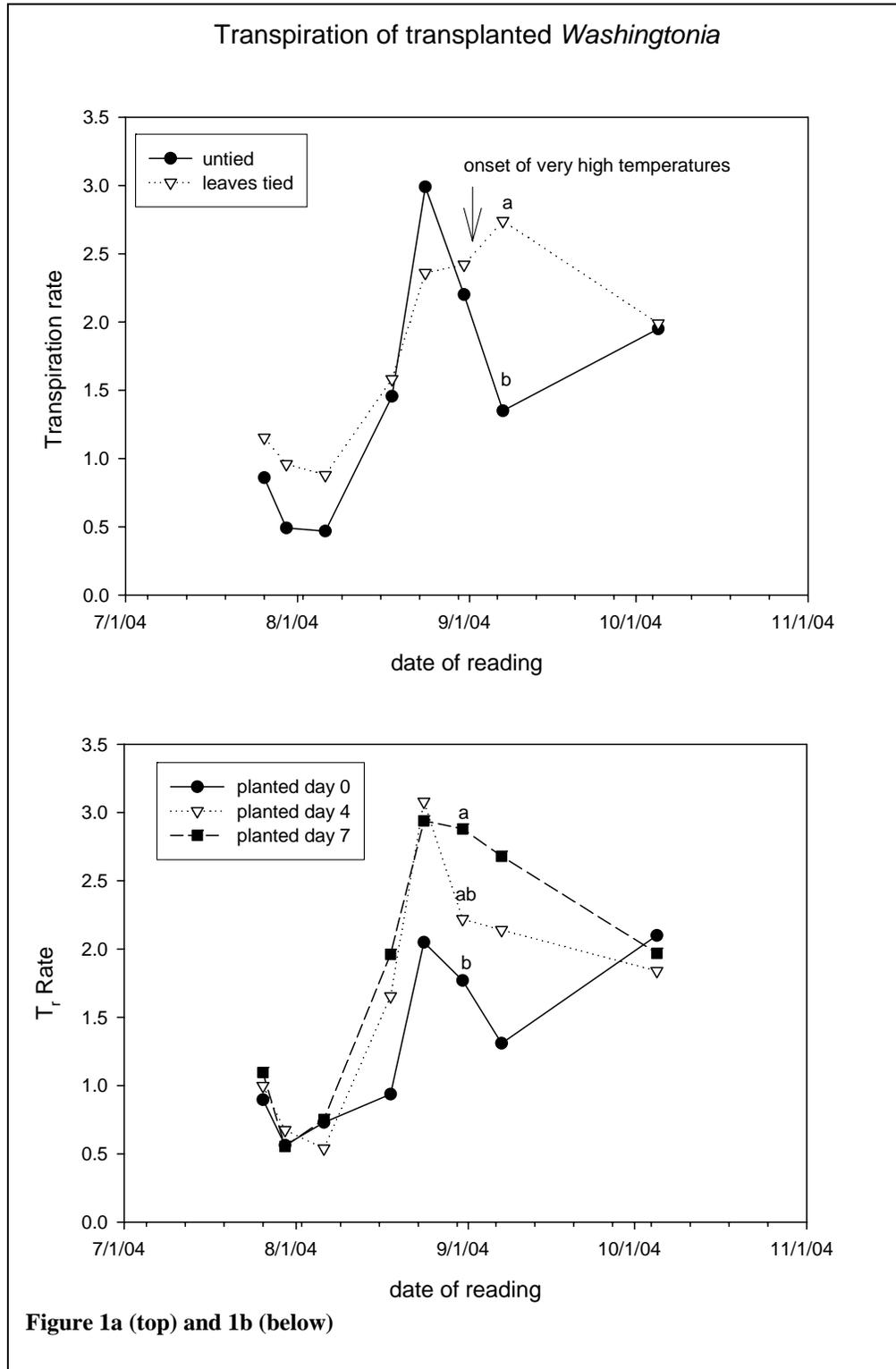


Table 1. Weather data during planting and pre-plant storage period, large *Washingtonia robusta* palms transplant study, South Coast Research and Extension Center, Irvine California, July 2004.

Date	Max. Air temp °F	Min Rel Humidity %	Et _o ^z (in.)
7/22	80.2	62	0.21
7/23	79.0	67	0.19
7/24	80.1	65	0.22
7/25	85.7	54	0.22
7/26	84.2	55	0.21
7/27	79.6	57	0.22
7/28	78.8	58	0.22
7/29	78.3	61	0.21

^zEt_o is the reference evapotranspiration estimated by the California Information Management Irrigation System weather station in inches.

Table 2. Effect of leaf tie up and pre-plant storage on mean leaf production six months after transplanting, large *Washingtonia robusta* palms transplant study, South Coast Research and Extension Center, Irvine California, January 2005.

Tie up	Mean Number of Leaves			
	brown	green	new	green+new lvs
-	5.8	5.9	4.8	10.7
+	4.5	6.6	4.5	11.1
<i>F statistic</i> ²	1.93	1.01	0.14	0.10
<i>Probability</i>	0.175	0.32	0.71	0.76
Pre-Plant Storage (in days)				
0	6.6	5.0b	3.9	8.9
3	4.0	7.2a	4.3	11.4
7	4.9	6.5ab	5.8	12.3
<i>F statistic</i>	3.51	3.79	1.88	3.47
<i>Probability</i>	0.056	0.04	0.17	0.058

²F statistics and probabilities are from the main effects of the factorial ANOVA. Letters following means represent separations according to LSD_{0.05}.

Table 3. Effect of leaf tie up and pre-plant storage on mean leaf production and petiole length 12 months after transplanting, large *Washingtonia robusta* palms transplant study, South Coast Research and Extension Center, Irvine California, July 2005.

Tie up	Mean Number New Leavesz	Mean Petiole Length (cm)
-	13.3	54.8
+	12.0	49.2
<i>F statistic</i> ^y	0.45	2.69
<i>Probability</i>	0.508	0.112
Pre-Plant Storage (in days)		
0	10.2	49.1
3	12.5	50.0
7	15.2	56.9
<i>F statistic</i>	2.66	2.09
<i>Probability</i>	0.088	0.143

^zNew leaves is sum of leaves formed one year after transplanting. Petioles measured from attachment to hastula.

^yF statistics and probabilities are from the main effects of the factorial ANOVA.