TropicLine

Horticulture Newsletter of the University of Florida Fort Lauderdale Research & Education Center

Volume 10, Number 3-4 *December, 1998*
Editor: Alan W. Meerow *Christine T. Waddill, Dean, Cooperative Extension*

Save Money Using Compost in the Growing Substrate

Kimberly A. Klock-Moore
Floriculture & Mineral Nutrition

Approximately 15% of the sewage sludge or biosolids produced from wastewater treatment is composted. However, composting biosolids and yard trimmings produces a product that has the potential to be used to grow a wide variety of plants.

Previous work at the University of Florida Fort Lauderdale Research and Education Center has shown that impatiens, petunia, begonia, snapdragon, dianthus, marigold, and vinca plants can be grown in 4"pots filled with media containing 60 to 100% compost made from biosolids and yard trimmings. Plant growth in compost is as good as or better than growth in a standard Canadian peat: vermiculite: perlite medium. One reason for greater plant growth in media containing compost is that compost tends to have complex organic compounds that break down slowly providing a nutrient reserve for plant growth. Furthermore, biosolids are known to be a nitrogen rich material that when composted will release significant concentrations of nitrogen. Considering that compost provides nutrients, it would seem logical that fertilization rates could be reduced when compost is incorporated into the growing medium.

Experiments conducted in spring 1998 with impatiens 'Accent Orange' investigated the growth of plants grown in 0, 30, 60 or 100% compost and fertilized with either 0.5, 1.0, 2.0, or 4.0 g per 4" pot of 13-13-13 Nutricote (6 month). Plant size was determined 40 days after transplanting (size is average of plant height and plant width).

Results (Table 1) show that plant size increased as fertilizer rate increased from 0.5 to 4.0 g per pot. Plant size also increased as the percentage of compost in the medium increased from 0 to 100%. Interesting plants grown in 0% compost with 4 g of Nutricote produced plants that were similar in size to plants grown in 30% compost with 0.5 or 1.0 g as well as plants grown in 60% compost with 0.5 g. Plants grown in 100% compost with 0.5 g were larger than all of the plants grown in 0% compost.

The recommended fertilizer rate for bedding plants is approximately 3 per pot. The 0.5 g less than one-quarter the recommended rate. Based on a cost of $13.95 for a 5 lb. box of Nutricote it would cost $12.56 to fertilize 500 pots at the 4 g rate but would cost $1.40 to fertilize at the 0.5 g rate. This works out to be a saving of $11.16. You also can figure that to purchase a 3.8 cu ft bale of Pro-Mix costs $19.25 and will fill approximately 271 4" pots at a cost of $ 0.07 a pot. However, compost is sold at a cost of $6 to 7 per cu yd. One cubic yard would fill approximately 1929 4" pots at a cost of $0.003 a pot. It is evident that the use of compost can save money when growing bedding plants.

Further research needs to be done on the growth of other plants in compost as well as the post-production longevity of plants grown in compost and the fate of chemicals (growth regulators, insecticides, herbicides, etc.) applied to media containing compost. Growers should be aware that when using compost, they should purchase the compost product from a reputable source and that the compost is properly aged. They also should be aware that there are many compost products on the market. All of this research has been conducted on composted biosolids and yard trimmings

obtained from the Solid Waste Authority in Palm Beach County. Different results may occur with other compost products or "home-made" composts.

Table 1. Impatiens 'Accent Orange' final plant size.

Percentage of Compost	Fertilizer Rate	Final Plant Size (cm)
0	0.5	6.67
	1.0	6.54
	2.0	7.94
	4.0	9.53
30	0.5	9.40
	1.0	9.08
	2.0	10.85
	4.0	11.94
60	0.5	9.40
	1.0	10.48
	2.0	12.07
	4.0	14.99
100	0.5	13.14
	1.0	12.19
	2.0	13.65
	3.0	15.75

Pindo Palm (*Butia capitata)* Seed Germination Revisited

Timothy K Broschat
Horticultural Physiology

Butia capitata is a cold-hardy palm commonly grown as a landscape ornamental in southeastern United States, as well as in California and Arizona. *Butia* fruits have an orange fleshy, but fibrous mesocarp and a hard, stony endocarp containing one to three seeds (Uhl and Dransfield, 1987). The "seeds" planted by nurserymen and previous researchers are actually endocarps, and when treated like other palm seeds, germinate very slowly and erratically over

a 2-year period. This poor germination has been attributed to dormancy (Carpenter, 1988) and to the thick, impervious seed coat (Sento, 1976).

Carpenter (1988) found that temperatures of 40 ^{o}C were optimum for germination in this species, and that the "seeds" responded positively to an after-ripening period of 30 to 150 days. He showed that mechanical or acid scarification, followed by soaks in gibberellic acid (GA_3) or deionized water did not improve germination time or percentage for this species. The purpose of this study was to evaluate endocarp removal as a method of enhancing *Butia* seed germination.

Materials and Methods

Experiment 1. The orange, pulpy mesocarp was removed from the mature fruits of two *Butia capitata* trees. These cleaned" seeds (endocarps) were air-dried at ~25 ^{o}C for two days. Five replicate lots of 100 endocarps each were subjected to the following germination treatments: 1.) immediate planting of the cleaned, intact endocarps; 2.) after-ripening storage of cleaned, intact endocarps in slightly moist sphagnum peat in polyethylene bags for 150 days at 23 ^{o} C prior to planting; or 3.) immediate planting of seeds obtained by cracking the endocarps in a vise. Endocarps in this seed lot contained an average of 2.3 seeds per endocarp. Propagules were dusted with thiram fungicide prior to planting or storage. Propagules were planted in flats using a 1 sphagnum peat : 1 perlite (v:v) medium with ~ 2 mm of medium covering the tops of the propagules. Flats were maintained under intermittent mist in a greenhouse with temperatures between 23 and 38 ^{o} C. The number of seedlings emerging each week was counted for each replicate. This experiment was terminated after no seedlings emerged for 4 consecutive weeks (17 months).

Experiment 2. Treatments and sample sizes in this experiment were identical to those in Experiment 1, but the propagules were germinated in polyethylene bags filled with moist sphagnum peat as described by Carpenter (1988). These bags were placed in a growth chamber maintained at 40 ^{o} C. Each week the contents of each bag were dumped into a tray, the germinated seeds counted and removed, and the ungerminated seeds and medium replaced in the bag. This experiment was terminated after 11 months.

Experiment 3. Treatments were similar to those in Experiment 1, except that seven replicate lots of 50 endocarps were germinated in flats maintained in a growth chamber set at 34 ^{o}C. After 56 weeks, a growth chamber malfunction forced us to move the seed flats into the greenhouse used in Experiment 1. This experiment was terminated after 17 months.

Experiment 4. This experiment differed from Experiment 1 in that four replicate lots of 50 endocarps were germinated in seed flats maintained at 40 ^{o}C in a growth chamber. The after-ripening storage time was 120 days instead of 150 days as in the other three experiments. This experiment was terminated after 7.5 months.

Results and Discussion

Experiment 1. Seeds with their endocarps removed began to germinate after 7 weeks (Fig. 1A). Endocarps that were not stored began to germinate after 47 weeks, while none of the after-ripened endocarps had germinated when the experiment was terminated after 17 months. The final germination rate for seeds planted with their endocarps removed averaged 133.6 seedlings per 100 endocarps, versus 0.8 for endocarps planted intact and without storage (Table 1).

Experiment 2. When endocarps and seeds were germinated in slightly moist sphagnum peat in polyethylene bags, most of the seeds without endocarps rotted. However, intact endocarps were generally unaffected by this seed-rotting fungus. Thus, this germination method is not suitable for seeds without endocarps. Final germination rate for after-ripened intact endocarps was 41.4 seedlings per 100 endocarps, versus 37.8 for non-after-ripened endocarps, a

non-significant difference (data not shown).

Experiment 3. Very little germination occurred in the growth chamber at 34 ^{o} C, during the first 56 weeks (36 weeks for after-ripened endocarps, due to later planting) (Fig. 1B). After 56 weeks, germination rate increased sharply following their transfer to the greenhouse with a maximum temperature of 38 ^{o} C. Time to 50% of final germination rate did not differ significantly among treatments, but final germination rate was significantly higher for seeds with endocarps removed than for intact endocarps (Table 1).

Experiment 4. Time to 50% of final germination rate in a seed flat maintained in a 40 ^{o}C growth chamber did not differ among treatments, but seeds without endocarps had significantly higher final germination rates than intact endocarps (Table 1, Fig. 1C).

These experiments showed that after-ripening storage of endocarps did not improve germination rate nor decrease germination time as reported by Carpenter (1988). Experiments 1, 3, and 4 each differed in some way from Carpenter's experimental design, but Experiment 2 followed his design and still did not show an improvement in germination time or rate for after-ripened seeds.

Germination rate was greatly increased by removing the endocarps. Since each endocarp contains from one to three seeds, germination rates of over 100 seedlings per 100 endocarps are possible with this method. Although germination of two seedlings from a single intact endocarp was observed once by the author, such seedlings cannot be physically separated and grown as normal single-stemmed palms.

As in most other palm seed germination studies (Broschat and Donselman, 1986; Carpenter, 1988; Nagao, et al., 1988), high germination temperatures were superior to lower temperatures. Experiments 3 and 4 were performed in 34 and 40 ^{o}C growth chambers, respectively, but little germination ever occurred at 34 ^{o}C. An average of 12 seedlings per 100 endocarps germinated after 56 weeks at 34 ^{o}C, versus 82 seedlings after 22 weeks at 40 ^{o}C for seeds without endocarps (Figs. 1B and 1C).

Although the endocarps in these experiments were individually cracked in a vise, commercial nut crackers have been successfully used for this purpose in Brazil (L. Van der Ven, personal communication). Endocarps were found to crack with less seed damage if they were allowed to air dry for two to three days following mesocarp removal.

In summary, endocarp removal appears to be a highly effective method for improving germination of *Butia capitata* seeds. This technique was not successful, however, when seeds were germinated in polyethylene bags filled with damp sphagnum peat. After-ripening storage does not appear to provide any advantage for the germination of *Butia* endocarps.

Literature cited

Broschat, T.K. and H. Donselman. 1986. Factors affecting storage and germination of *Chrysalidocarpus lutescens* seeds. J. Amer. Soc. Hort. Sci. 111:872-877.

Carpenter, W.J. 1988. Seed after-ripening and temperature influence *Butia capitata* germination. HortScience 23:702-703.

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

Sento, T. 1976. Studies on the germination of palm seeds. Memoirs of the College of Agric., Ehime Univ. 21:1-78.

Uhl, N.W. and J. Dransfield. 1987. Genera palmarum. Allen Press, Lawrence, Kans.

Table 1. Effects of endocarp removal and after-ripening storage on germination time and rate for *Butia capitata*

	Greenhouse (23-38^{o} C)		Growth chamber (34^{o} C)^{w}		Growth chamber (C)	
	Germination		Germination		Germination	
Treatment	Time ^{z}	Rate^{y}	Time ^{z}	Rate^{y}	Time ^{z}	Ra
Endocarp removed	42.4	133.6 a	57.6	93.7 a	11.5	82.
Endocarp intact, not stored	46.0	0.8 b	48.2	15.1 b	17.8	26.
Endocarp intact, stored	---	0.0 b	41.3	19.1 b	12.3	21.
Significance (P)	0.021	<.0001	0.204	<.0001	0.075	0.0

^{z}Time in weeks to 50% of final germination rate.

^{y}Seedlings / 100 endocarps.

^{x}Mean separation within columns by Waller-Duncan k-ratio method, k=100.

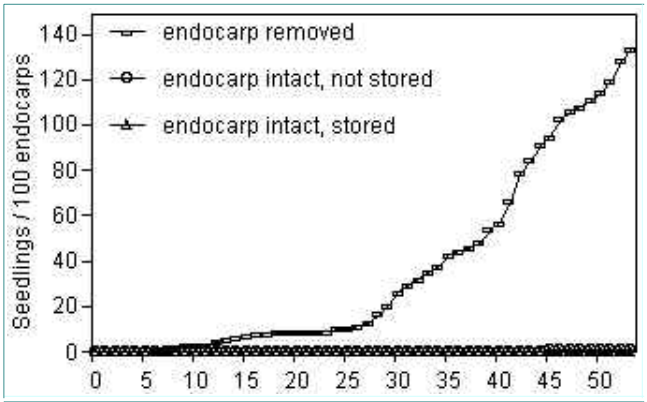

Figure 1A

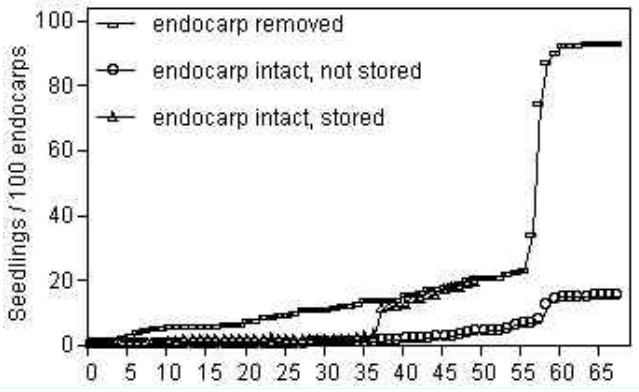

Figure 1B

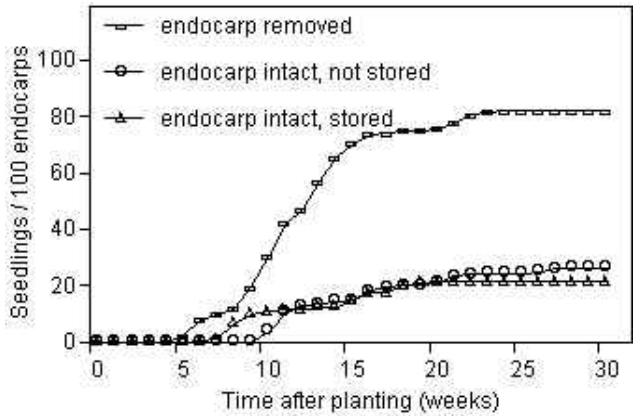
endocarp removed
endocarp intact, not stored
endocarp intact, stored
Seedlings / 100 endocarps
0
20
40
60
80
100
0
5
10
15
20
25
30
Time after planting (weeks)

Figure 1C