COMPARISONS OF NURSERY PRACTICES FOR GROWING OF *Rhizophora* SEEDLINGS

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ABSTRACT

Four methods for germinating and growing of *Rhizophora* seedlings were simultaneously tested in a slathouse under uniform conditions, glass jars, nursery pots, tree pots, and Jiffy 7 peat balls. All watering was from municipal tap, with weekly soluble acid fertilizer, and no other chemicals applied. Results showed the clear superiority of the Jiffy 7 under test conditions. Mortalities and comparative costs of production are discussed, including the planting out process. Jiffy 7 methodology proved most cost efficient, and both Jiffy 7 and tree pots had longer shelf life than the other methods tested.

INTRODUCTION

Within the past decade mitigation plantings have become commonplace in wetlands everywhere in the State of Florida. As an observation, the growing of plants for mitigation plantings has not been in the hands of skilled horticulturalists generally. Understandably, a decade ago when care of the environment during development passed from the realm of the dream of the few to the legal necessity for all, academicians were nearly the only the ecologic technicians available for a field which had no capital, no literature, and almost no experience. The plants were not available commercially as a rule, a condition which will hopefully be changing as did large scale landscape design in the sixties. We should be moving from the back yard growing of mitigation plants in discarded plastic dishpans, fastfood foam coffeecups, and salvaged tin cans to the standardized production of high quality planting stock for which trained Florida nurserymen have justly become renowned. It would also be desireable to see all such efforts planned by demonstrably skilled ecosystemic architects and constructed by licensed contractors. None of that will make any sense unless state and county agencies get serious about boat wakes, off-the-road four-wheelers, and the variety of tracked and airplane engine vehicles one finds in our wetlands, and totally banning the presence of any of them except in designated areas. If it is to be legal to require environmental protection and re-establishment from owners of lands, the corrollary must be that police powers be employed for the protection thereof.

In a small effort to begin a look at quality in mitigation plantings, an experiment was devised to test various methods currently in use by the

growers of both mitigation and physiology red mangroves, *Rhizophora mangle* L.,and to test a departure from those practices that had great theoretical promise.

MATERIALS AND METHODS

The experiment was performed on benches in a wood slathouse designed to produce 50% shade, the 2x4cm slats spaced 4cm and running north-south. The location was in South Miami, Dade County, Florida, USA.

Mangrove propagules were collected from healthy trees in Key Largo, Florida, and were culled visually for symptoms of insects or disease. 100 propagules from 15 to 25cm in length were divided into four groups of 25, each exhibiting the full size range. Each group was planted uniformly as follows:

Group 1. Placed into 124ml babyfood jars with ca.100ml of tap water. This method approximates that of laboratory physiologists who might also use seawater or formulated experimental waters.

Group 2. Planted into plastic pots 66mm OD x63mm, using a 1:1 sterilized soil mix of everglades peat and silica sand that is commercially available to nurseries in the Dade-Broward market area. This method approximates the mean of current nursery practice.

Group 3. Planted into plastic tree pots measuring 58mm square and 122mm deep using commercial sponge clippings to not only seal the open bottom of the pot, but to furnish a hygroscopic aid to moist soil conditions, a method much utilized in the Bahamas nurseries.

Group 4. Planted directly into Jiffy 7s, a manufactured product from Norway. The product is a compressed disk of peat measuring 9x47mm as packed complete with a planting depression and in a nylon net which controls the shape after wetting. 15 minutes after soaking the disk, it expands to 30x50mm, and is then ready for planting. Plastic trays measuring 28x55.5cm are manufactured to contain 55 Jiffy 7s.

Watering was daily, using tap water as distributed by the Dade County Water and Sewer Authority. All plants were fertilized weekly using an end-of-hose siphon sprayer and Stern's Miracid soluble fertilizer diluted at the manufacturer's recommended rate of 1.27g/l (1 tsp/gal). The acid formula was

chosen because a previous experiment had indicated that such a product might avoid chlorosis (Reark, 1982), and no chlorosis developed during the course of this experiment. No rooting hormones, fungicides, insecticides, or any other chemical were applied to the propagules at any time. The experiment was begun April 23, 1983, reported on May 19, 1983, and concluded on June 5, 1983.

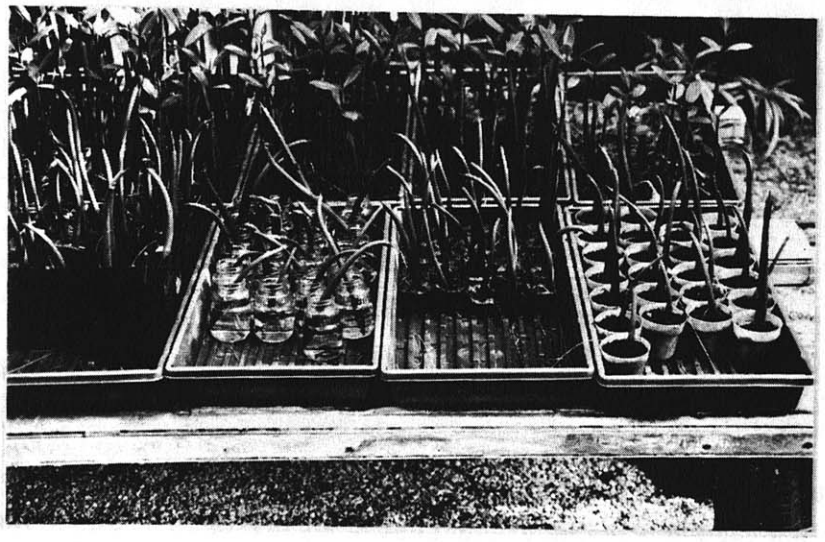

Fig.1. Photograph taken April 23, 1983 showing the benched experiment. Left to right, Group 3 - plastic tree pots, Group 1 - glass jars, Group 4- Jiffy 7s, and Group 2 - standard nursery pots. Each group is in its own 28x55.5cm plastic tray, and all face south. Note the comparative space that 25 planted propagules occupies in the standard tray.

RESULTS

The first rooting became apparent in Group 1, the glass jars, on May 14, at which time each method was analyzed for presentation and photographed. Group 1 at that time had 3 propagules with definite roots to 4mm, Group 2 had 5 propagules with roots to 10mm, Group 3 had 13 propagules with roots to 15mm, while Group 4 had 18 propagules with roots showing through the fabric of the Jiffy 7 to a distance of over 20mm from the center (Fig.2). Each propagule was returned to its own pot or jar, and the observations

continued until a pattern of time of leaf formation could be established.

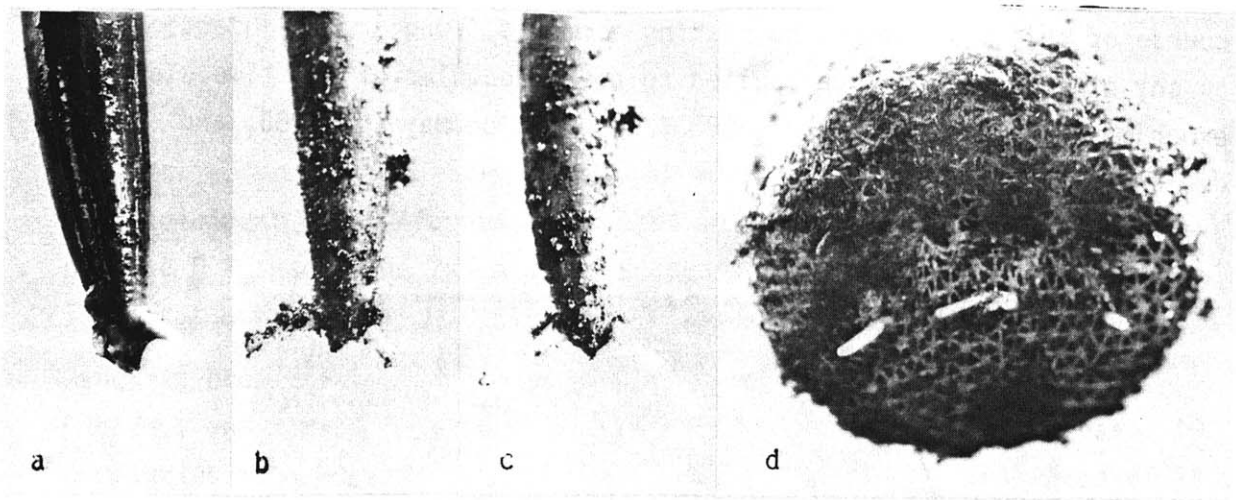

Fig.2. Rooting after three weeks, red mangroves. (a) Group 1 - glass jars, (b) Group 2 - nursery pots, (c) Group 3 - tree pots, and (d) Group 4 - Jiffy 7, the last showing typical root emergence. All photos x 1.2 natural size.

By June 5, sufficient growth had occurred to compare the methods for a judgement of nursery efficiency and cost comparisons.

GROUP	ROOTING	FOLIAGE
1 - glass jars	8	5
2 - nursery pots	12	7
3 - tree pots	17	17
4 - Jiffy 7s	22	22

Table 1. Summary of state of red mangrove propagules at the end of six weeks. Foliage indication is leaf vernation after shedding of the stipule. It should be noted that groups 1 and 2 had no expanded leaf pairs at this time, while groups 3 and 4 had 10 and 13 respectively.

Due to the short length of the experiment, no mortality figures could be assembled. However, the high mortality using standard #6 plastic nursery pots (ca. 15cm ID), which approached 50% under freshwater conditions, is what prompted the search for a better method. Experience with many trays of both tree pot and Jiffy 7s have given tree pot growth after one year at an average of 40cm with 3 pairs of leaves and a mortality which averages at 7 per tray and none after plant out, while the Jiffy 7s give a much more

uniform growth of 50cm, 3 pairs of leaves, and mortality of 2.6 per tray (Fig.3), as compared with 200 #6 pot plants with averages of 35cm growth, 3 pairs of leaves, and mortality of 42%. There is a further mortality after plant out of the #6s, against none for tree pots or Jiffy 7s to date.

Fig.3. Exuberant growth exhibited by trays of red mangroves in Jiffy 7s planted July 15, 1982 and photographed May 14, 1983.

DISCUSSION

The results of this experiment can be readily translated into dollars per unit area. The plastic tray accupies an area of 1554cm^2 and will hold 36 of the 124ml glass jars (group 1), 30 of the plastic pots of group 2, 36 of the group 3 tree pots, and 55 Jiffy 7s. Two rows per bench plus one aisle 45.7cm wide (18 in) will give a realistic unit area per plant and this can be integrated with the current market average price of $ 1.00 to give the following tabular results:

GROUP	UNITS M^2	(SqFt)	NET SALE M^2	(SqFt)
1	164.4	15.22	$ 164.40	$ 15.22
2	136.9	12.68	$ 136.90	$ 12.68
3	164.4	15.22	$ 164.40	$ 15.22
4	251.2	23.26	$251.20	$ 23.26

However, when mortalities are figured into the tabulation, the figures change dramatically:

GROUP	% MORTALITY	NET SALE M^2	(SqFt)
1	32%	$ 111.80	$ 10.35
2	42%	$ 79.40	$ 7.35
3	19%	$ 133.16	$ 12.33
4	5%	$ 238.64	$ 22.10

To return to the analysis of production on a per plant basis, we get the following costs:

mangrove propagule collection @ $ 0.06 - 0.08

care and watering per month @ 0.012

nursery set-up per month @ 0.92/M^2 - 0.085/SqFt
varies by group, see tabulation u/a

costs of pot ready to use: Group 1. Cheap if you have a baby + dishwasher
Group 2. $ 0.04 - 0.06 with soil
Group 3 $ 0.06 - 0.08 with soil/sponge
Add $ 0.51 for plastic tray, varies u/a
Group 4. $ 0.071 w/tray

The production costs per seedling at six months will thus be theoretically be close to $ 0.30 - 0.35 each, but application of the mortalities again widens the gap between the Jiffy 7 and other methods tested. All mortalities have been derived from 11 years of horticultural experience with red mangroves at the South Miami site.

The final cost information under the conditions of an inland site using freshwater irrigation is that the shelf-life of Groups 1 & 2 is between 3 & 6 months before transplantation is necessary, and that Groups 3 & 4 will not only endure for at least 15 months, but can be planted out as is at the rate of one per minute by virtually anyone at no loss.

Under the conditions of this experiment, the Jiffy 7 method demonstrated better growth and a higher economic efficiency than did other techniques.

LITERATURE CITED

REARK, J.B. An *in situ* fertilizer experiment using young *Rhizophora*. *in* Webb, F.J., ed. 1982 Proceedings of the Ninth Annual Conference on Wetland Restoration and Creation. Hillsborough Community College, Tampa, Florida.