SUMMARY:

1. Methods of raising Eucalyptus seedings in jiffy pots are described at a field station without adequate nursery facilities.

2. Potting soil mixes of 3% Nitrophoska (red) and 6% by volume were used. The addition of blood and bone to the 3% mix gave equal results to the 6% mix.

3. Time to fill pots indicated 100 per hour/man. 5,300 pots required 18 c. ft. of potting mix. = 3½ c. ft / thous. pots.

4. Sowing rates of pots is 600 per man per hour.

5. Most desirable size of seedlings was found to be 6" - 8".

6. Cost of direct sown pots estimated at 2¾d. / pot or £1D.15.6/1000 and transplant stock £15.3.6/1000. from flats to pots.

7. Descriptions of watering, shading and handling of pots are also included.

8. Sowing times ranged from January 1963 to March 1963.

OBJECTIVES:

The availability of compressed peat jiffy pots, provided a means of raising Karri seedling stock (and other selected species) to plant up understocked cut over Karri forest in between non seed years, when burns in cut over Karri forests were not successful for regeneration. The size of the pot (2½") was considered suitable to allow large quantities to be handled economically and with little loss of stock.

POTTING SOIL MIXTURE AND PREPARATION:

The soil mixture used in potting was prepared from black humic forest sand (obtained on Ridge Road, Channybearup) and Karri forest red brown loam collected in T/R 21763 near Coppinup Mill on 13/12/62.

This was initially sieved with ⅜" sieve and then mixed in the ratio of 2 parts sand to 1 part forest loam. To this was added nitrophoska fertilizer (red) at the rate of 30 lbs. to 27 cubic feet to give a 3% additive of this fertilizer. The whole mix so prepared was then placed beneath a black polythene sheet 12' x 12' sealed with earch around the edges and a methyl bromide fumigation carried out, leaving the soil for 48 hours after release of the gas. All mixing of the soil was done by hand with a shovel on an old canvas sheet.

From this mix (called Mix 1), 3000 jiffy pots were filled, which used 10 c. ft. of mix. To the remainder, a further 20 lbs of Nitrophoska (red) fertilizer was added to make a 6% mixture by volume of fertilizer additive. The soil mix was again mixed with shovel. This constituted Mix 2. From this, a further 5,300 jiffy pots were filled, taking 18 c. ft. Time of filling pots indicated 100 per hour per man. The balance remaining has been bagged and stored.

The Nitrophoska (red) fertilizer is classified as containing the following percentages of chemicals:

Nitrogen (as nitrate and Ammonia)		13% by weight/ton
Phosphoric Anhydride -	Water soluble	5.4%
	Citrate soluble	7.6%
Potash (K_2O)	Muriate	20.0%
Traces Cu		0.002%
Zn		0.011%
Mn		0.002%
Mgo		Trace
Mo		Trace
B		0.001%

METHODS OF SOWING POTS:

Following potting, jiffy pots (see photo 5) were placed on the ground in blocks ranging up to 1,000 in the shade house. In this position, seed was sown directly on to the pots after these had been soaked with water, using an adapted plastic salt shaker which permitted 6 to 7 seeds to pass out when shaken twice. It was found necessary to hold the shaker near the pots to avoid missing the pots with seed, and also to reverse the pot to the upright to avoid blockages. Improvements could be made in the type of shaker used.

After sowing, seeds were covered with $\frac{1}{4}$" of sand or vermiculite and watered again.

The sowing operation was carried out both by two men and one man. In the former case, the first man sowed seed, the second covered the seed with sand or vermiculate, the first finished proceeding to water down pots. Using two men it was found possible to sow 50 pots in rows of eleven in $3\frac{1}{2}$ minutes. For large blocks of pots, a board was placed over the pots supported on a block at each end on which the seed sower and assistant worked. These were found inconvenient and maintaining pots in blocks not wider than 20 pots, where access is possible from either side seems desirable. Ten rows is the maximum number which can be leant over during seeding, by one man working alone, 50 pots were sown in $4\frac{3}{4}$ minutes.

During sowing of pots it was found necessary to water down vermiculite rapidly to avoid being blown away by the wind. The time of sowing extended from January 1963 to March 1963.

The amount of seed used varies according to purity, but figures show 37 grams (about 1 oz.) of Karri seed were used on 3,000 pots and 43.2 gms. on another test of 3,009 pots.

SUBSEQUENT TREATMENT:

After sowing, watering was carried out at least daily and a watering rose used by hand suitable for the water pressure available. This was extremely poor, but using a rose spray with a forged brass body and galvanized brass plate, a very soft fine spray was obtained suitable for this work.

The length of time which stock were held in the nursery shed varied from 8-15 weeks.

Shade control during this period remained fairly constant, readings at 3:15 p.m. on the 22.3.63 were as follows: (using Weston Mk IV exposure meter).

i) Under slatted roof - 45.5%
ii) Under sisalcraft - 91%
iii) Inside shade house W/out cover - 57.5% ± 20%.
iv) Outside shadehouse - 100% ± 10%.

At the end of the period in the shade house, each pot was thinned to one or two vigorous seedlings and then placed in standing out frames (see photograph 1) after being placed in carrying boxes. Blood and bone was added to some stock at a pinch/pot on the 1/4/63, to the 3% fertilizer potted mixture.

STANDING OUT FRAMES:

Standing out frames were constructed from Jarrah as shown in photograph 1, to hold stock during the hardening off period. These frames are 36' x 5' 6" x 4' high with a centre ridge pole and boarded up sides to 1'. All wooden members have been treated with a Sodium pentachlorphenol swabbing by mop. ($\frac{1}{2}$ gallon of Santabrite to 50 galls. of water plus $\frac{1}{4}$ lb. soda ash), as an antifungicide.

The construction of the frames allows a "Sarlon" cloth to be placed over the frame to reduce lighting as necessary. "Sarlon" cloth is a plastic weave material which as obtained, is dark sea green in colour and available in various mesh sizes, giving estimated shading from 30-81%. Costs of these weaves range from 7/7 sq. yard to 12/8 per sq. yard.

The bottom of the frames consists of levelled sand, to allow free drainage of water away from cases with seedling stock.

CARRYING BOXES:

These were constructed from pine case shooks such that the case was in two halves, each of which could hold 25 jiffy pots: or a complete box 50. When wet, these boxes weigh roughly 30% heavier than dry boxes. (see photograph 2) Weight dry is 7 lbs. An easy method of carrying these in the field has not been devised.

The size of stock when stood out ranged from 3" - 12" depending on the time since sowing. Stock sown in late January 1963 were about 12" tall when stood out to harden on the 11/5/63.

During the period in the shade house, "Dithane and Zebtox, spraying at recommended concentrations was carried out on Fridays as a preventive measure against "damping off."

METHOD OF HANDLING TRANSPLANTS (Acacia melanoxylon):

Seedlings were raised in seed flats early in summer to 1" - $1\frac{1}{2}$" inches when they were lifted and pricked out into jiffy pots.

The operation was carried out in the mid summer months and many deaths resulted.

The procedure was to insert a small dibber in the jiffy pot and place the seedling into it and tamp it down firmly. All pots were thoroughly moistened before transplanting and pots watered after being placed in the shade house. The whole operation was done under a tarpaulin where temperatures were as cool as possible, but exposed to desiccating east winds.

The potting rate of 700/day/man is obviously an uneconomical method (see table 2) and the direct seeding method is preferred.

NATURE OF TRIALS IMPLEMENTED:

The main trials implemented with these pots were in relation to fertilizer additives to soil mix used in potting species used and covering of seeds sown with sand or vermiculite.

1. Fertilizers added - initially nitrophoska (red) mix 1 and mix 2.
   - at about 8 weeks, Blood and Bone (one pinch per pot).
2. Species Sown - Euc. diversicolor
   Euc. muelleriana
   Euc. sieberiana
3. Potted - Acacia melanoxylon
4. Seed Coverings - Sand ¼" deep
   Vermiculite ¼" deep.
5. Growth Trials - Various sowing dates with correlated heights of stock (see below)

TABLE 1

Serial No. of Batch	Potting Mix.	Sowing Date	Height of Seedlings at 25/7/63	Post Sowing Fertilizers	Seed Source
K1	6% fertilizer	22/1/63	14"		↑
K2	6% fertilizer	22/1/63	9"		
K3	6% fertiliser	22/1/63	11"		Serial
K8	6% fertilizer	22/1/63	11"		No. 1 ex
K18	6% fertilizer	22/1/63	15"		Warren
K12	3% fertilizer	23-24/1/63	12"	B&Bone 1/4/63	Block.
K4	6% fertilizer	23/1/63	14"		↓
K16 & 17	3% fertilizer	24/1/63	13"	B&Bone 1/4/63	
K19	6% fertilizer	12/2/63	8"		↑
K10	3% fertilizer	13/2/63	10"	B&Bone 1/4/63	
K9	3% fertilizer	15/2/63	8"	B&Bone 1/4/63	
K21	6% fertilizer	18/2/63	7"		Serial
K23	6% fertilizer	19/3/63	3"		No. 6 ex
K24	6% fertilizer	27/3/63	3"		N'Cliffe.
					↓

Results todate are set out in Table 2 (see photographs 3-4) which indicates development of seedlings in relation to:

a) different soil potting mixes

b) sowing seed at different times as indicated

c) there became evident a difference in seedlings from the 3% and 6% nitrophoska, three months after sowing. Stock from 3% nitrophoska were becoming unthrifty. Blood and bone was added at a pinch per pot.

At the time of planting, the difference in fertilizer levels was not apparent as reflected in health and size of stock, although the blood and bone had

obviously assisted the 3% level of fertilizer. Later results may be important however.

d) Success in raising seedlings was not considered promising as results in tenus of failures are shown in Table 2. The type of covering of seeds does not seem significant: rather the time of year when sowings are made.

WATERING METHODS:

Some preliminary watering of jiffy pots was done by hand with a watering can with a rose attached. The dribbles from the can caused damage in the pots, the surface covering being extremely fragile after sowing.

Therefore, a watering rose was fitted to a hose connected to a very poor water pressure, as described on page 2. This gave desired results. Watering was required frequently on hot days to prevent drying out, which was particularly noticeable around the edges of the blocks of pots. Earth ramps around blocks and hessian bags helped to overcome this trouble.

SHADE CONTROL:

After sowing, pots were kept in 100% shade until after germination. The period of time kept in full shade was about 14 days after germination, when plants were placed under bush thatch (Zamia palms). Seedlings remained under this shade for 2-3 months.

Shade intensity is set out on page 3. These determinations were made using a Weston MK IV exposure meter.

ECONOMICS OF VARIOUS PHASES OF TECHNIQUE:

During the handling of these pots, times were recorded for various operations. Details of these are set out below; they are considered a fairly accurate guide to costs involved.

TABLE 3

OPERATION	PREPARATORY WORK	ESTIMATED TIME (Man Hrs/1000)	MATERIAL COST £. s. d.	ESTIMATED COST @ 10/-/ man hr/1000 £. s. d.	COSTS ex A.P.M. Victoria £. s. d.
1. Direct Sowing of Pots. (Euc.diversicolor) (Euc.muelleriana) (Euc.sieberiana)	A) Collecting soil sieving, sterilizing & mixing.	1.5	-	15. 0	Included Below.
	B) Potting soil @ 170 lbs./1000	5.0	3. 6	2.13. 6	15. 0.
	C) Seeding pots	1.7	6. 0. 0	6.17. 0	7. 0. 0.
	Totals	8.2	6.13. 6	10. 5. 6	7.15. 0
2. Pricking out Ac.melonoxylan	1) Pricking out seedlings into boxes and standing out	11.5		5.15. 0	-
	2) Materials etc.		9. 8. 6	9. 8. 6	-
	Totals			15. 3. 6	

These indicate a total cost of raising direct sown jiffy pots at 2¾/pot and transplanted jiffy pot stock at 3½d./pot.

GENERAL COMMENTS:

Observations on stock raised indicated that for best overall results at least to the planting stage, a plant about 6"-8" tall is desirable. At this stage, stock have the following advantages:-

1). Do not suffer excessive damage during transportation to the field.

2). Permit sowing about 4 weeks later in summer than larger stock, when watering is an expensive item (and not costed in above costings).

3). Do not foul the carrying case handles when carried in the field.

4). Have a reasonably well developed root system and shoot to enable it is hoped good establishment.

5). Are less weight to carry in the field.

Some disorders were observed in stock sown about February 1963; this was characterized by chlorotic condition of the leaves and was suspected of being associated with an iron deficiency. Therefore, three levels of Fe So 4 treatment (as crystals) were applied with a control. The levels were 4, 8, and 12 gms/pot (Photograph 5 shows the condition 3 months after treatment). This was equivalent to 56, 112, 224 lbs. per acre. No effect of treatment has been observed.

Stock of Euc sieberiana were attacked locally in the standing out frames by Jarrah leaf minor. The reasons for this attack are not understood, as field wildlings locally of the same species have not been observed to have been attacked.

A.J. Hunt.

ASSISTANT SILVICULTURIST.

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28.8.63.

(1) SEEDLING DEVELOPMENT IN JIFFY POTS WITH DIFFERENT POTTING MIXES 1 and 2.

SERIAL NUMBER	SEED ORIGIN	POTTING MIX No.	Date of Sowing	ROOT LENGTH	SHOOT LENGTH	CROWN WIDTH	SHOOT LENGTH ROOT RATIO	SHOOT CROWN RATIO
K16-17	Warren block	1	24/1/63	3"	13"	4½"	4.3	2.9
19	North-cliffe	1	12/2/63	5"	8"	4½"	1.6	1.78
10	"	1 (B)	13/2/63 *	2½"	9"	1¾"	3.6	5.15
12	Warren	1 (B)	23/2/63 x	4½"	15	3"	3.3	5.0
		MEANS		3¾"	11¼"	3.4"		
K1	"	2	22/1/63	5	17	3"	3.4	5.6
9	North-cliffe	2 (B)	15/2/63	3½"	7½"	3"	2.15	2.5
21	"	2	18/2/63 *	5½"	7½"	2"	1.36	3.75
23	"		19/3/63	2½"	2¾"	1"	1.1	2.75
		MEANS (excluding 23)		4⅔"	10⅔"	2⅔"		

(2) SEEDLING DEVELOPMENT IN JIFFY POTS WITH DIFFERENT SOWING TIMES (January 63 to March 1963).

K1	Warren	Too large-damaged in transit (B)	22/1/63	3½"	16"	3½"	4.5	4.5
K16-17	"		24/1/63	4"	13"	3"	3.25	4.3
12	"		23-24/1/63 *	2"	13¾"	2½"	6.8	5.5
19	North-cliffe		12/2/63	2½"	8"	1¾"	3.2	4.5
10	"	Considered Suitable Size	13/2/63	2½"	10¼"	3"	5.0	3.4
9	"		15/2/63	2"	5¾"	2"	2.8	2.8
21	"		18/2/63	5¼"	6½"	1¾"	1.2	3.7
23	"	Too Small	19/3/63	1¾"	2½"	¾"	1.4	3.3

* Swollen rootlets observed.

x Purplish tips to rootlets.

(8) - Blood + bone added

(3) LOSSES IN POTS UP TO 6/5/63.

Stock Origin	Total Sown	Survivors Boxed	Failure % Mean 29/3/63	Survivors at 6/5/63	Failure % (Overall)	Date of Sowing
(1) Mix 1 Karri +Vermic-ulate cover	1,000	672	33	619	38.1	23-24/1/63
(2) Mix 2 Karri + Verm.	1,000	650	35	521	47.9	23/1/63
(3) Mix 2 Karri + Sand.	2,109	1,222	42	1,112	47.3	22/1/63
(4) Mix 1 Karri + Sand	1,200	506	57	450	62.5	13-15/2/63
(5) Mix 2 Karri + Sand	1,000	868	13	819	18.1	11/2-27/3/63

AUGUST 1963.

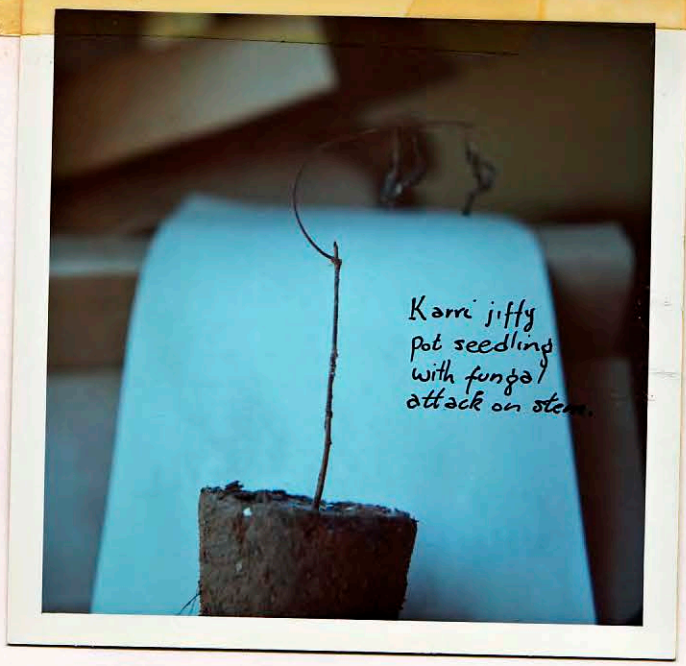
1. Development of Karri seedlings at different ages within the range 4½ – 6 months.
2. Plants have been removed from jiffy pots to show root development.
3. Sowings made between 22/1/63 and 19/3/63.

AUGUST 1963.

1. Comparison between stock raised in two types of soil mixes – Mix 1 and Mix 2.
2. Plants again removed from jiffy pots to show root development.
3. Dates of sowing of each sample shown.

AUGUST 1963.

1. Photo of Karri seedlings (within black frame) treated with FeSO4 and CONTROL.
2. There is no apparent change due to treatment at this stage.
3. Treatment was given due to onset of poor colour and chlorotic condition of leaves.



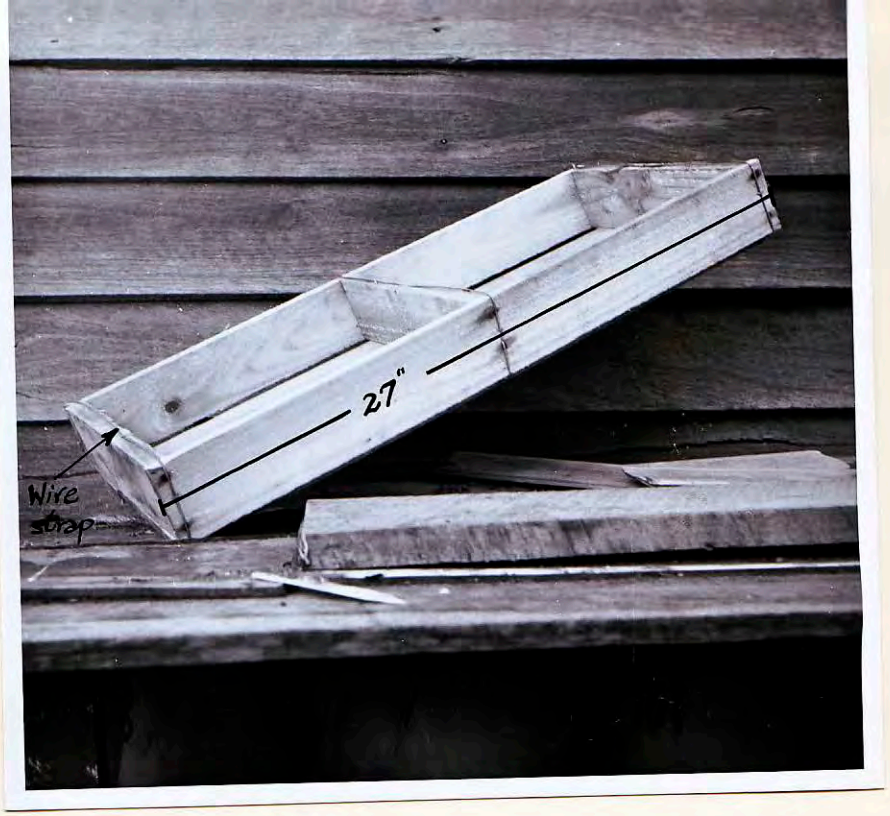
Karri jiffy pot seedling with fungal attack on stem.

AUGUST 1963

1. Fungal attack on Karri jiffy pot stock after standing out. — disorder appears as a rotting of bark cambium anywhere along the stem with ultimate death of seedling.
2. Crowding may be a causative factor, as the outbreak was sporadic.

JULY 1963

1. Appearance of jiffy pot stock (larger size) after travelling 26 ~~old~~ miles on the back of a truck.
2. Jiffy pots were frequently broken and stock generally in damaged condition.
3. Smaller stock travelled and arrived in much better condition.

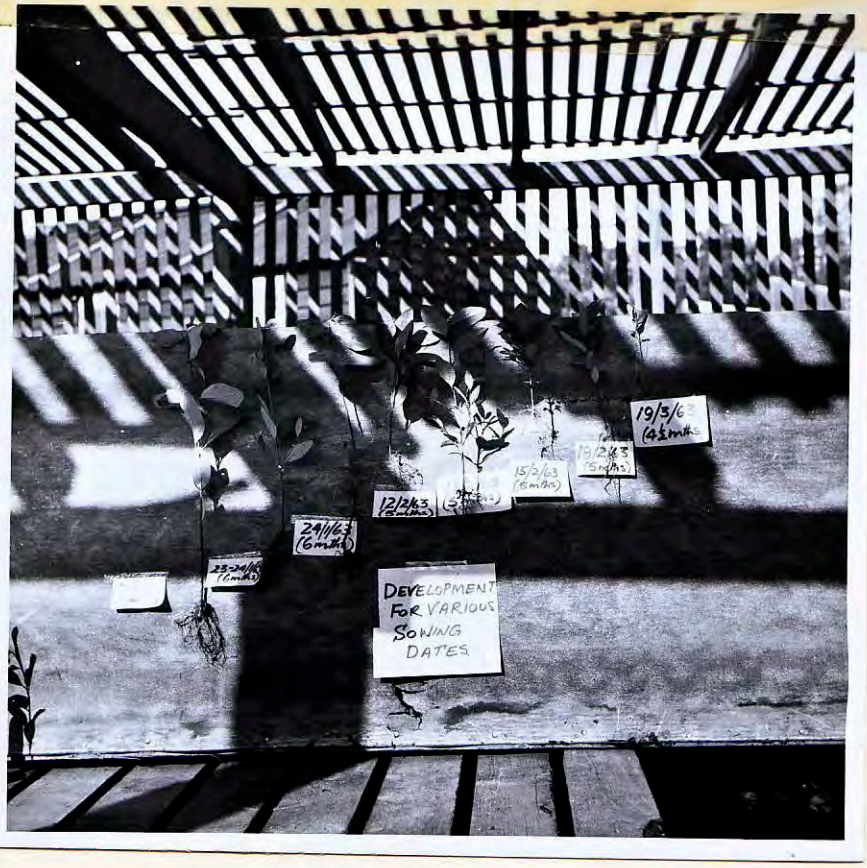


Tiffy Pot Carrying Case (Pine treated with Sodium pentachlorphenol)

Tiffy pot carrying case plus detachable carrying handle.

Standing out frame at Mjp Research Nursery with loam floor. (Frame treated with sodium pentachlorpheno!. drench applied with floor mop).

Euc. sieberiana :.
Range of development in jiffy pot seedlings raised at Mjp Research Nursery.



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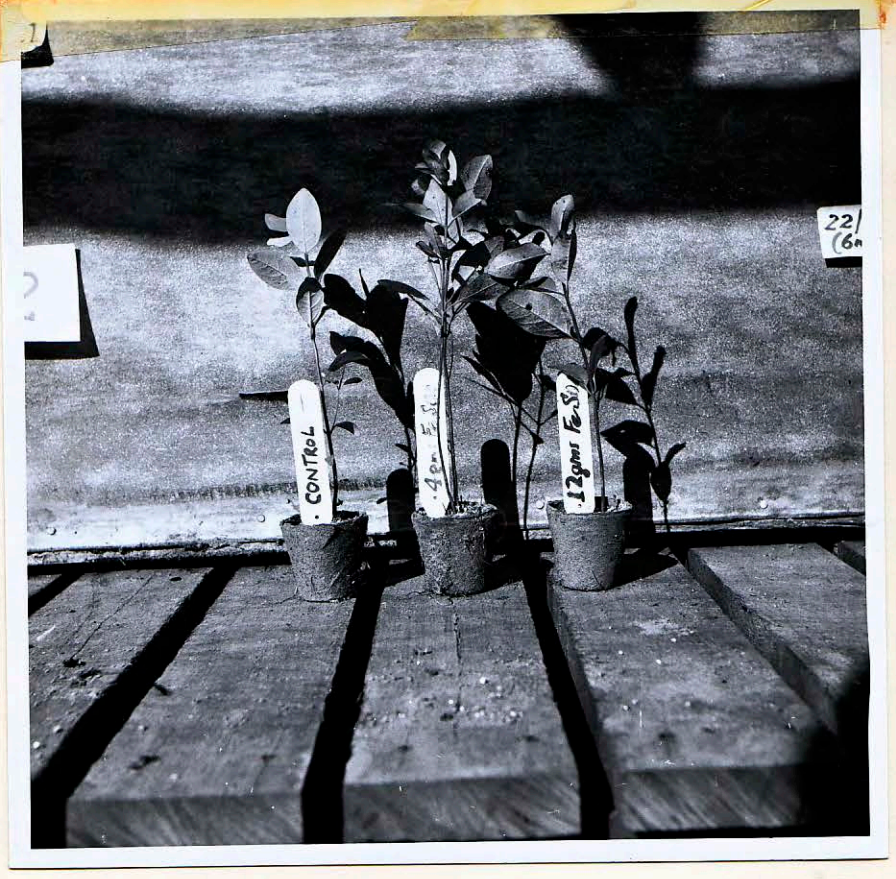

August 1963.

1. Photo of Karri seedlings (treated with $FeSO_4$ and CONTROL)
2. There is no apparent change due to treatment at this stage.
3. Treatment was given due to onset of poor colour and chlorotic condition of leaves.