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## TESTING METHODS FOR PRODUCING RADIATA PINE PROPAGULES FOR CLONAL TRIALS AND KEEPING MATERIAL AS PHYSIOLOGICALLY JUVENILE AS POSSIBLE

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REPORT No. 25 NOVEMBER 1991

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# EXECUTIVE SUMMARY

## TESTING METHODS FOR PRODUCING RADIATA PINE PROPAGULES FOR CLONAL TRIALS AND KEEPING MATERIAL AS PHYSIOLOGICALLY JUVENILE AS POSSIBLE

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A nursery method of maintaining juvenility in *Pinus radiata* stool beds and enabling production of even-sized cuttings soon after sowing is necessary for clonal forestry.

To develop a reliable method, four regimes were tried. In the first regime, seed was sown in containers in a glasshouse. For the other regimes seed was sown in outdoor covered beds.

In Method 1, seeds were sown, lined out, topped and pinned down and then cuttings set in outside or a combination of outside and igloo conditions. Rooted cuttings were then lined out and later collected for clonal testing. Methods 2 and 3 were as above with seeds sown outside. Method 3 also had a thinning stage after topping. In Method 4, seeds were sown and later cropped using the outside and a combination of outside and igloo conditions then lined out as rooted cuttings and later collected.

The most successful system of the four tested was a combination of an outside (Winter) plus polythene igloo (Artificial Spring) environment. This environment has proved successful in the past for preventing fungal attack and promoting quick rooting in radiata pine fascicle cuttings. The method has the potential of producing an average of 180 unrooted cuttings/clone within 2 years from sowing with no clonal dropouts occurring because of failure to produce the initial cutting shoots.

# TESTING METHODS FOR PRODUCING RADIATA PINE PROPAGULES FOR CLONAL TRIALS AND KEEPING MATERIAL AS PHYSIOLOGICALLY JUVENILE AS POSSIBLE

## INTRODUCTION

To achieve a successful nursery system for clonal forestry, a method has to be developed to maintain juvenility in *P. radiata* stool beds for up to 12 years.

The ability to produce even-sized cutting material as soon as possible after sowing is an important factor in this system.

## TRIAL DESIGN

Seed was sown from 11 seedlots. There was seed from 10 highly ranked '268' series half-sib families, and one control lot. There were four treatments, 12 clones/family/treatment and three replications of the treatments in the nursery bed. Two seeds were sown per stool bed spot, with one seedling being removed at a later date if necessary. Thus there were 96 seeds sown per seedlot (4 treatments x 4 clones x 3 replications x 2 seeds/spot).

Treatments

Method 1

| | |
|---|---|
| July 1988 | Sow seeds in containers in glasshouse |
| October | Line out at 20 x 40 cm |
| March 1989 | Top and pin down |
| June | Collect and set cuttings using outside*1 and outside-igloo systems*2 |
| November | Line out rooted cuttings |
| June 1990 | Collect and set cuttings for clonal test. |

Method 2

| | |
|---|---|
| September 1988 | Sow seeds in pairs in outside beds (with protection) |
| March 1989 | Top and pin down |
| June | Collect and set cuttings using outside and outside-igloo systems |
| November | Line out rooted cuttings |
| June 1990 | Collect and set cuttings for clonal test. |

Method 3

| | |
|---|---|
| September 1988 | Sow seeds in pairs in outside beds (with protection) |
| February 1989 | Top and pin down |
| March | Thin cuttings to 1 cm apart |
| June | Collect and set cuttings using outside and outside-igloo systems |
| November | Line out rooted cuttings |
| June 1990 | Collect and set cuttings for clonal test |

Method 4

| | |
|---|---|
| September 1988 | Sow seeds in pairs in outside beds (with protection) |
| April - Sept 1989 | Crop cuttings during this period using outside and outside-igloo systems |
| Nov - Dec | Line out rooted cuttings |
| June 1990 | Collect and set cuttings for clonal test. |

*1 Cuttings set in containers and rooted outside under 30% sarlon shade cloth

*2 Cuttings set in containers and kept outside for 4 weeks and then moved into a polythene tunnel house to promote early rooting.

NOTE Methods 1 & 2 were abandoned at the time of setting as they produced far less cutting material than Methods 3 & 4.

**PROPAGATION SYSTEM**

In June 1989, fascicle and side shoot cuttings were collected from Treatments 3 and 4.

Cuttings were set in Hillson rootrainers containing a 3:1 peat pumice mix and 100 grams of Magamp/$m^3$ of mix.

The containers were placed outside under 30% shade and watered twice daily for the first 10 days. Routine irrigation was applied after this as necessary.

After 4 weeks, half the clones were removed to an open-ended polythene igloo. The temperature of the igloo was 0°C minimum to 27°C maximum compared with an outside temp of -4°C minimum to 16°C maximum at this time of year (July).

The igloo cuttings were not kept misted but were watered to keep the rooting medium moist.

In Treatment 4, the process was repeated, with cutting collection taking place in August 1989.

**ROOTING OF CUTTINGS**

Cuttings under igloo conditions commenced rooting at the end of August and by the end of November had made sufficient roots to be lined out into stool beds.

Cuttings under outside conditions (30% shade) commenced rooting at the end of October and had made sufficient roots to be lined out into stool beds by mid-January 1990.

**DEVELOPMENT OF STOOLS**

The stool bed ramets that passed through the outside and then igloo system were ready for topping by March to produce cuttings by June 1990. It was estimated that each ramet would produce approx. 5 cuttings. (The ramets were not topped as it would put them out of phase with the outside system ramets).

The stool bed ramets that passed through the outside system were too small to top in March for cutting production.

Note: 2.4% of lined out rooted cuttings did not survive. (Assessed 3 months after lining out).

## RESULTS

See Appendix 1 for full family results (i.e., number of cuttings produced/family).

**TABLE 1** **% ROOTING IN THE TWO ENVIRONMENTS TESTED**

| Date Set | Outside (30% shade) | Outside and then Igloo |
|---|---|---|
| June | 90 | 98 |
| August | 92 | 97 |

Notes In the outside (30% shade) environment approx. 3% of cuttings were lost before rooting because of shade cloth flap.

## DISCUSSION

Treatments 1, 2 and 3 suffered from lack of stem length at "pinning down and " thus no advantage was gained over Treatment 4.

If a usable stem length of >20 cm could be achieved from sowing (September) to "pinning down" (February), then the "pinning down" systems may have some merit.

In both environments tested rooting was >90% but the advantage of early rooting in the outside-igloo propagation system is necessary to produce cutting material for clonal tests within 2 years from sowing.

The recommended system (Appendix 2) is a relatively cheap, simple and efficient method of producing suitable material for clonal testing.

The ability to produce even sized clonal material in a short period of time from seed makes this system valuable as a tool for clonal forestry and other forestry research disciplines including breeding.

## APPENDIX 1

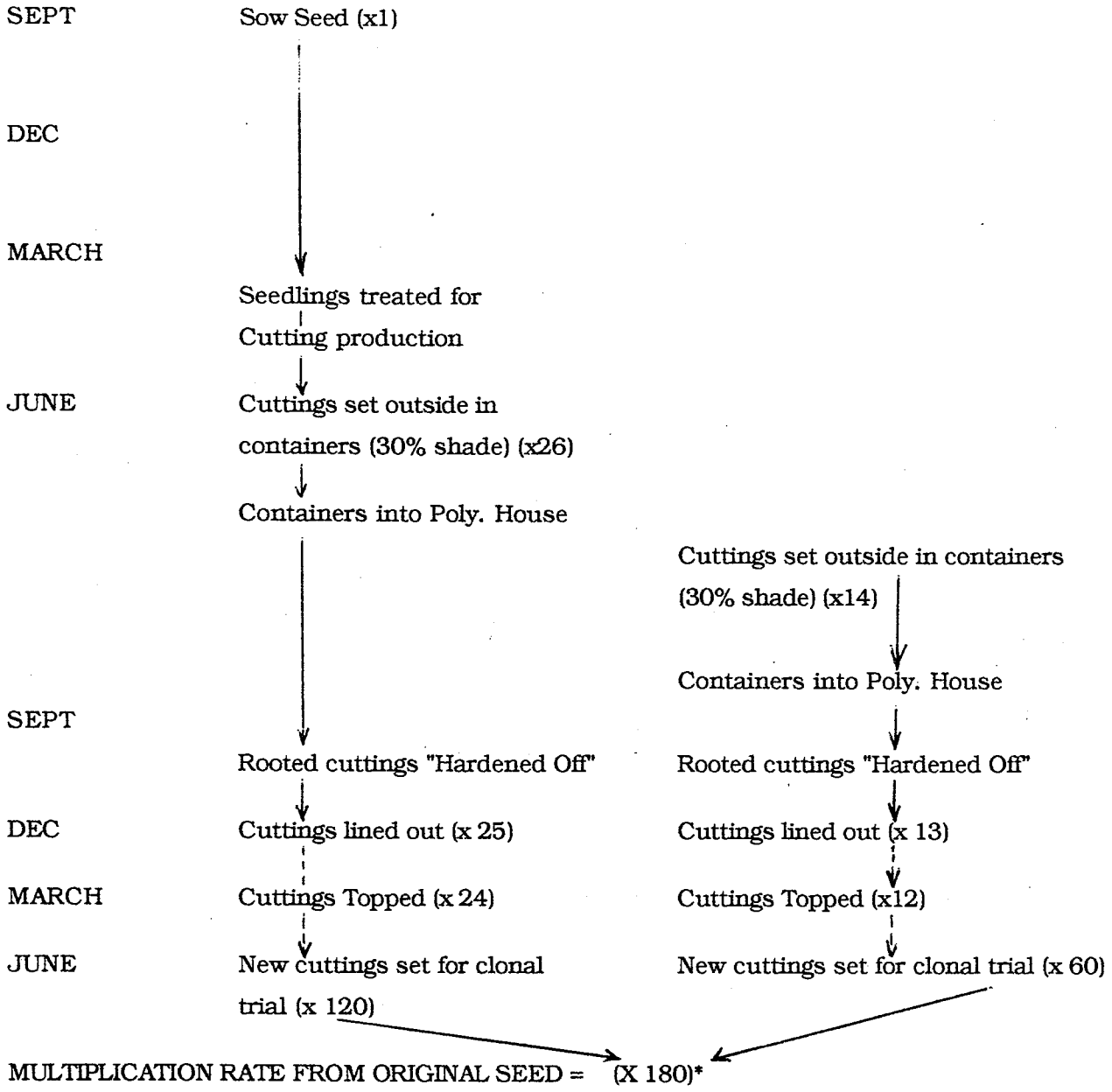
### NUMBER OF CUTTINGS PRODUCED (AV. OF CLONES WITHIN FAMILIES)

| Family | | Method 3 | | | Method 4 | | |
|---|---|---|---|---|---|---|---|
| | | Av/Clone | Max | Min | Av/Clone | Max | Min |
| 188 | 100 | 17.9 | 27 | 7 | 34.0 | 63 | 14 |
| 268 | 041 | 25.8 | 40 | 14 | 42.4 | 71 | 17 |
| | 109 | 22.4 | 31 | 12 | 41.4 | 70 | 13 |
| | 323 | 23.8 | 31 | 12 | 35.6 | 55 | 19 |
| | 345 | 21.6 | 42 | 14 | 34.8 | 56 | 19 |
| | 405 | 17.6 | 28 | 12 | 41.1 | 61 | 27 |
| | 494 | 21.7 | 37 | 5 | 46.6 | 75 | 15 |
| | 530 | 20.5 | 34 | 8 | 41.8 | 63 | 28 |
| | 532 | 16.3 | 29 | 12 | 38.7 | 61 | 5 |
| 268 | 547 | 23.8 | 34 | 14 | 44.8 | 63 | 21 |
| 850 | 055 | 23.1 | 57 | 11 | 43.3 | 67 | 19 |
| ALL | | 20 | 57 | 5 | 40 | 75 | 5 |

NOTE In Method 4 - 35% of cuttings produced by August setting.

## APPENDIX 2

### RECOMMENDED METHOD FOR PRODUCTION OF CUTTING MATERIAL FROM <1 YR OLD P. RADIATA SEEDLINGS FOR STOOL BED ESTABLISHMENT




* Cuttings would be 7-10 cm in length and 3 to 3.5 mm in diameter.

Dotted line - - → denotes part of system not tested in this trial. Has been verified by previous work.