RESULTS OF PINUS RADIATA - GERMINATION PRETREATMENTS

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Summary

1. There is no significant difference between length of time of stratification of 1, 7 and 21 days.

2. A beneficial germination energy effect is noted for seed stratified for 21 days after a 1 day's soak.

3. Statistically better germination occurs after 21 days but the effect is lost after 28 days ($F>0.01$ level of significance).

4. "Thiram" is not of significant value in these phases of pretreatment under germination cabinet conditions.

5. The benefit or not of using "Thiram" Coating requires field testing.

6. Pretreatment has been demonstrably better than no treatment at all.

Introduction

Indifferent and variable results of P. radiata seed germination in nurseries after standard pregermination treatments (one day soak and 3 weeks wet stratification at 4-5^{o}) made a review of procedures in use desirable.

Stratification procedures for P. radiata which have been in use at Como since 1969, at least, are set out in appendix 1 (procedures for P. Pinaster are also included).

It is evident that current procedures now deviate from the original by way of:

1. wet stratification is 3 weeks in lieu of 4 weeks at 4-5°C.

2. drying is achieved usually during one (1) to two (2) days to get the whole batch ready for transport to nurseries.

3. Turning of barrels weekly has not been strictly adhered to as experienced during this period over a number of years indicated mould or drying has never been a problem.

4. Seed is no longer dusted with "Captan" since the chemical was classified as carcenogenic. "Thiram" is currently used and consequently has been included in the experiments described in this report.

A simple 2 x 3 factorial design experiment with two sub blocks allowing for ± treatments of seed with the fungicide "Thiram", at recommended rates. (5gm/kg of seeds as powder).

Other factors which may include germination percentage have not been addressed in these experiments as they have already been reported.

What cannot be evaluated at this stage are the interactions which may be involved.

It is now clear that many factors are involved which affect germination and viability ranging from (1) rainfall during cone expansion (2) excessive tumbling in extractors (3) mould growth on cones during storage maturation, (4) heat of extraction and (5) duration, (6) winging damage, (7) possible germination loss from mechanical damage during grading (under test at present) quite apart from damage which could occur in storage e.g. high moisture content and temperature, fungicide interactions and finally nursery bed conditions.

The work of E.R. Hopkins (as per Bulletin No 81 1971) is relevant when considering the question of nursery sowing time and optimum germination. (Fig 1 page 8 refers). It is evident that sowing in September or late August coincides with an inherent period of poor germination presumably due to ambient climatic conditions.

Method

Pinus radiata seed (serial No. 755 ungraded) was used in the experiments being drawn randomly from several barrels of seed in cool store at 4-5^{o}C at Como.

This seed had been extracted at West Manjimup after collection from non P.C. tolerant trees in the West Manjimup Seed Orchard in 1986.

It has been assumed that any effects of the extraction process (see previous reports on P. radiata seed germination depression due to mechanical tumbling and dewinging) have been equally distributed over all seed used.

Seeds were taken as 25 seeds/replicate after an initial soak of one day and then placed in stratification at 4-5^{o}C either dry or wet and for varying time spans in the presence or absence of "Thiram", a fungicidal powder seed coat dressing applied in acqueous form. The seed was dried after application.

The control of two (2) replicates each of 25 seeds was given no treatment at all other than the cool storage prior to commencement of this and unknown effects involved with extraction processes.

TREATMENTS

Treatments given to seed replicates are summarized in Table 1:

TREATMENT	"THIRAM"	DRY STRATIFICATION 1DAY	DRY STRATIFICATION 1WK STRAT	DRY STRATIFICATION 3WK STRAT	WET STRATIFICATION 1DAY	WET STRATIFICATION 1WK STRAT	WET STRATIFICATION 3WK STRAT	NO. REPL
1	-	CONTROL - NO TREATMENT AT ALL						2
2	+	✓			✓			4
	-	✓			✓			4
3	+		✓			✓		4
	-		✓			✓		4
4	+			✓			✓	4
	-			✓			✓	4
Total Reps		4	4	4	4	4	4	26

Total No. of Seeds = 650

Treated seed replicates were placed in a 'LINDBERG' germination cabinets at 20C MIN - 25^{o}C MAX with programmable light regimes, in standard 9cm "Petri" dishes with, Whatman filter papers and vermiculite substrate and programmable light of 2 x 180 fluorescent tubes set for 12hrs light and 12 hrs darkness.

Tests started on 19/1/86 with germinating seed being counted each 7 days.

Results

1. Table 2 summarizes germination counts for 28 day periods at which time tests were discontinued. These counts indicate that three (3) week soak stratification after a 1 day water soak is the better treatment.

3. Sta tistical analysis indicates that germination is best after 21 days stratification in terms of germination energy (F>0.001 level of probability), however, overall there is no significant difference between length of time and stratification.

4. There seems to be no beneficial effects of using "Thiram" dusting either when seed is wet or dry at time of application.

5. Graph 1 depicts progressive germination percentage for each treatment.

Recommendation

1. Seed stratification procedures continue to opt 1 day water soak followed by preferably 21 days cold moist atification. As graph 1 shows, there is a benefit in terms of ination energy after this length of stratification.

2. The use of "Thiram" does not appear w d up to the time of sowing. Field testing is equired to benefits or not of pre sowing treatment with his fungic

Acknowledgement

The assistance of Messrs. D. d and e acknowledged with thanks on these experiments.

Germination results from seven (7) day counts over a total period of 28 days.

TABLE 2

STRAT. TYPE	Time	Rep No.	+"THIRAM" 7D	14D	21D	28D	TOTAL %	-"THIRAM" 7D	14D	21D	28D	TOTAL %
1.WET (4-5°C)	1D	1	4	9	1	0	56	8	11	1	0	80
		2	8	11	1	0	80	7	11	0	1	76
		TOTAL	12	20	2	0	68	15	22	1	1	78
	7D	1	5	13	0	0	72	6	7	0	0	52
		2	7	10	0	0	68	6	10	0	0	64
		TOTAL	12	23	0	0	70	16	17	0	0	66
	*21D	1	12	3	0	0	60	14	3	1	0	72
		2	17	4	0	0	84	14	4	0	0	72
		TOTAL	29	7	0	0	72	28	7	1	0	72
2.DRY (4-5°C)	1D	1	5	12	1	0	72	9	10	1	0	80
		2	5	11	0	0	64	3	15	0	0	72
		TOTAL	10	23	1	0	68	12	25	1	0	76
	7D	1	5	13	0	0	72	7	10	1	0	72
		2	7	10	1	0	72	9	8	0	1	72
		TOTAL	12	23	1	0	72	16	18	1	1	72
	21D	1	1	7	12	0	80	8	12	0	0	80
		2	2	6	12	0	80	5	13	1	0	76
		TOTAL	3	13	24	0	80	13	25	1	0	78
3. CONTROL		1	0	16	2	0	72					
		2	0	8	5	1	56					
		TOTAL	0	24	7	1	64					

* Standard Current Practice

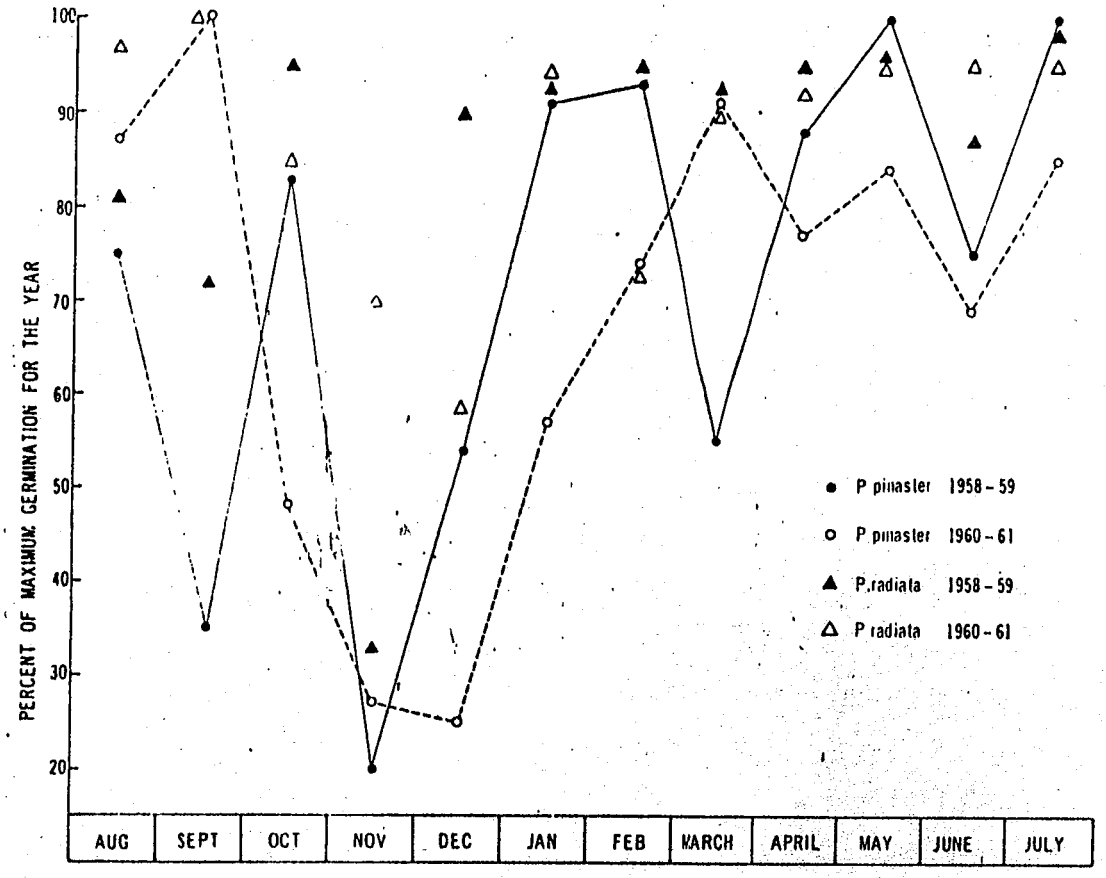
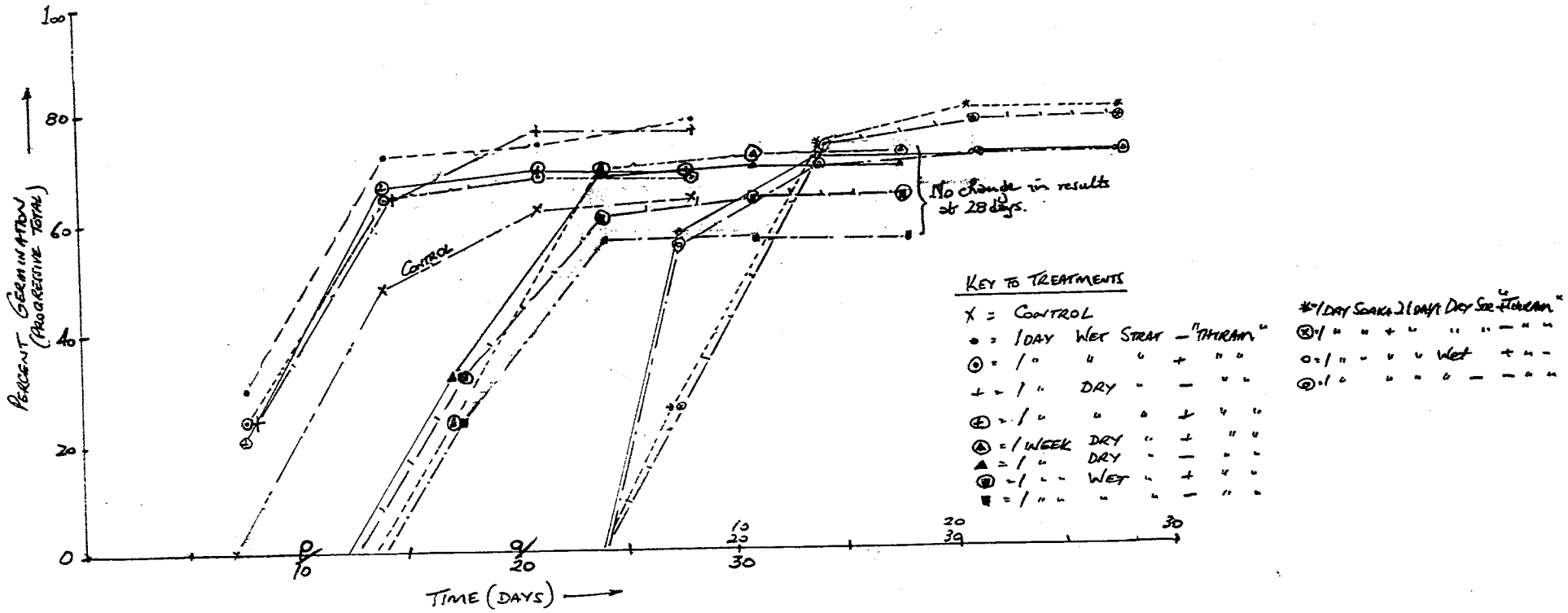


Figure 1.
Variability in germination obtained by sowing at monthly intervals in the open. Results for both *P. pinaster* and *P. radiata* are compared over two separate twelve month periods.
(After Hopkins 1971)

Results revealed that monthly germination may depend on species, seed batch and ambient conditions (Figure 1). From the data it appears safe to say that the best time to test *P. pinaster* with the standard technique is in April-May and July-August. The poorest time, which was for both species and is hence probably associated with ambient conditions, is during the months October to January. Assuming that test conditions approximate nursery conditions the trial confirms the fact that July-August is the best time for nursery sowing in the Perth Metropolitan region.

PINUS RADIATA PREGERMINATION TESTS OF SEED S/ND755 (UNGRADED) JAN. 1987

GRAPH. 1.



PINE STRATIFICATION PROCEDURE

The yearly pine sowing programme commences at Gnangara nursery on the first week in August. Sowing at Nannup follows the completion of the Gnangara operation. Pinus pinaster only is sown at Gnangara and Pinus radiata at Nannup. It is important that seed is stratified and ready for the start of sowing. The following steps are therefore necessary:

(1) Prepare stocktake of all Pinus pinaster and radiata seed stock.

(2) Carry out germination tests of all serial numbers in the stock.

(3) The figures from items (1) and (2) must be presented to Silviculture Manager not later than the second week in June to allow time for him to work out the yearly programme and advise on what quantity and serial numbers to stratify.

(4) Pinus pinaster requires one week in soak, four weeks stratification and one week to dry. P. radiata has a 24 hour soak, four weeks stratification and one week to dry. It is therefore necessary to commence P. pinaster stratification before the last week of June. P. radiata is left for two or three weeks later to allow for shorter soak period and later planting date.

(5) After receiving the quantity and Serial Nos. from the Silviculture Manager, the seed is stood aside. Full drums are divided into three drums and others in two, or left as is, depending on their contents.

EACH OF THESE GROUPS OF 3, 2 or 1 ARE NUMBERED WITH THE SAME NUMBER SO THAT EACH ORIGINAL DRUM CAN ALWAYS BE LOCATED.

(6) The drums are filled with water six inches above the top of the seed. This allows room to separate floatus at end of soak. The drums are filled outside the cool room, then placed inside and the lids screwed on.

(7) At the end of the soak period, (7 days for pinaster and 1 day for radiata) the drums are taken outside and the floatus removed. With radiata seed, unless a distinct zone of water is between the floatus and the bottom seed, floatus are not removed.

(8) The sieve lid is then screwed on each drum and the water drained off.

(9) After draining the seed is returned to the cold room, the lid screwed on and the drums laid on their side.

(10) The drums are turned weekly to prevent surface drying or mould.

(11) At the completion of the stratifying period the seed is removed from store, air dried, and dusted with CERASAN.

It is important that serial numbers be kept separate at all stages.

(12) On completion of the dusting the seed is returned to the original drums that carried their weight and Serial No.

(13) The orders for the individual nurseries are separated and a list outlining the following attached to one of the drums: