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Report to: Horticultural Development Council
18 Lavant Street
Petersfield
Hants GU32 3EW
Tel: 0730 63756

ADAS Contract Manager: J G Farthing
MAFF/ADAS
Lee Valley Experimental Horticulture Station
Ware Road
Hoddesdon
Herts EN11 9AQ
Tel: 0992 463623

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CONTRACT REPORT

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Effects of a range of Covering Materials on Germination 1988

Undertaken for HDC

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PRINCIPAL WORKERS

S R Ellis BSc. Hons. Hort. (author of report)

AUTHENTICATION

I declare that this work was done under my supervision according to the procedures described herein and that this report represents a true and accurate record of the results obtained.

..... J G Farthing
Contract Manager
Date 19-1-89

Report authorised by: .....
pp. P Allington
Head of Experimental Horticulture Stations
MAFF/ADAS
Nobel House
17 Smith Square
London SW1P 3HX

EFFECTS OF A RANGE OF COVERING MATERIALS ON GERMINATION 1988

Summary

Seeds of Impatiens, Petunia, Primrose, Salvia and Verbena were sown into trays of standard seed compost. Coverings of peat, peat/sand, coarse sand and medium or coarse vermiculite were applied to a depth of 1 - 2 mm or 5 mm. Uncovered controls were also sown.

Germination of Impatiens, Petunia and Primrose was significantly reduced ($P = 0.05$) by 5 mm covers compared with 1 - 2 mm (means of all covering materials).

Germination of Salvia was reduced but not quite significantly, by the 5 mm layers of peat or coarse sand. These results suggest that germination of these four species may be improved when some light can reach the seed.

By contrast, germination of Verbena was improved by the 5 mm covers compared with 1 - 2 mm (means of all covering treatments), indicating that light should be excluded during germination.

Considering the results of trials in 1987 and 1988, it is concluded that 1 - 2 mm of coarse vermiculite was the best of the treatments tested for those species which require some light for germination and 5 mm of the same material was the best for species which germinate better in the dark, eg Verbena.

Introduction

According to species, bedding plant seeds may be left uncovered for germination or covered by various depths of different materials; most growers probably use the seed compost on which the seed has been sown.

The object of these trials was to determine the effects of a range of covering materials on the germination of bedding plants.

The trial in 1987 (C87/0361) compared coverings of peat/sand, peat, coarse sand and medium or coarse vermiculite all at depths of 1 - 2 mm or 5 mm on Marigold, Petunia, Salvia and Verbena. The only significant effects were:

a) germination of Salvia was suppressed by a 5 mm cover of coarse sand, and

b) germination of Verbena was improved by all the covering materials compared with the untreated control in which the percentage germination was very low (3.2%).

The trial in 1988, the subject of this report, compared similar coverings to the previous year on Impatiens, Petunia, Primrose, Salvia and Verbena. The number of seeds sown per plot was increased in 1988 to 100 compared with 50 in 1987 in order to improve the sensitivity of the experiment.

Materials and Methods

Site: a germination room at Lee Valley EHS

Treatments

1	Covering materials:	no covering
		ADAS 100% peat (seed) compost
		ADAS peat/sand (seed) compost
		Medium vermiculite, 2 mm particle size
		Coarse vermiculite, 4 mm particle size
		Coarse sand, 1 mm - 5 mm particle size
2	Depth of covering:	1 - 2 mm
		5 mm
3	Species:	Impatiens Dwarf Baby
		Petunia Super Formula
		Primrose Easter Bouquet
		Salvia Blaze of Fire
		Verbena Sparkle

In order to contain seed costs, standard quality seed was used rather than expensive hybrids which could cost up to 20 times more.

The ingredients of the two seed composts used as covering materials were as follows:

100% medium Irish peat
or 75% medium Irish peat, 25% coarse sand
plus 4 kg ground chalk per m^3 peat
plus 1 kg single superphosphate and
0.5 kg potassium nitrate per m^3 of mixed compost

All were mixed thoroughly prior to use

Design

One plot consisted ot 100 seeds in a half standard seed tray. There were three replicates of each treatment in a fully randomised design.

Assessments: the number of seedlings with expanded cotyledons from 100 seeds sown was counted when germination appeared to be complete.

Statistical Analysis: the records were subjected to Analysis of Variance.

Cultural conditions

Sowing: half seed trays were filled to a depth of 25 mm with the 75% peat, 25% sand seed compost (see under "Treatments"). 100 seeds were sown per tray and the experimental coverings applied. The trays were covered with a clear film plastic and placed in a germination room with a low level of illumination

Diary:

Species	Date sown	Date recorded	Temperature setpoint °C
Impatiens	3 March	21 March	20 - 22
Petunia	"	17 March	20 - 22
Primrose	"	24 March	18 - 20
Salvia	"	18 March	20 - 22
Verbena	"	18 March	20 - 22

Results and Discussion

Table 1: Impatiens: Number (%) of seedlings with fully expanded cotyledons at the final count (18 days from sowing)

	Covering Material						
Depth	Peat	Peat/ sand	Vermiculite medium	Vermiculite coarse	Coarse sand	Depth mean	Cont mean
1-2 mm	74.7	78.0	82.0	89.0	80.0	80.7	-
5 mm	74.7	72.0	77.0	82.7	71.0	75.5	-
Mean	74.7	75.0	79.5	85.8	75.5	78.1	77.7

SED's: between uncovered (control) and covered (treatment) means = 2.91 (25df)
between depth of covering means = 2.37
between covering materials means = 3.75
between figures in the body of the table = 5.31

Because of variability in the experiment, comparison of means is more reliable than comparisons of values in the body of the table.

The difference between the control mean and the all treatments mean was not significant at P = 0.05. 5 mm covering produced a decrease in germination compared with 1 - 2 mm which was just significant at P = 0.05. Coarse vermiculite resulted in a significantly higher germination than all other treatments except medium vermiculite (mean of both depths) and was the only treatment which was better than uncovered control.

Table II: Petunia: number (%) of seedlings with fully expanded cotyledons at the final count (14 days from sowing)

	Covering material						
		Peat/	Vermiculite		Coarse	Depth	Cont
Depth	Peat	sand	medium	coarse	sand	mean	mean
1-2 mm	52.7	47.3	45.3	48.7	51.0	49.0	-
5 mm	50.3	45.0	45.7	42.3	30.0	42.7	-
Mean	51.5	46.2	45.5	45.5	40.5	45.8	47.3

SED's: between uncovered (control) and covered (treatment) means = 2.93 (25df)
between depth of covering means = 2.40
between covering materials means = 3.79
between figures in the body of the table = 5.36

Because of variability in the experiment, comparison of depth of covering means is more reliable than any other. This comparison shows that 5 mm cover significantly reduced germination compared with 1 - 2 mm (mean of all covering materials) and this result was strongly influenced by the large difference between the two depths of covering with sand.

Table III Primrose: number (%) of seedlings with fully expanded cotyledons at the final count (21 days from sowing)

	Covering Material						
		Peat/	Vermiculite		Coarse	Depth	Cont
Depth	Peat	sand	medium	coarse	sand	mean	mean
1-2 mm	19.33	18.33	26.00	25.00	25.00	22.73	-
5 mm	19.67	16.00	23.67	19.67	16.33	19.07	-
Mean	19.50	17.17	24.83	22.33	20.67	20.90	24.67

SED's: between uncovered (control) and covered (treatment) means = 1.87 (25df)
between depth of covering means = 1.52
between covering materials means = 2.41
between figures in the body of the table = 3.41

Because of variability in the experiment, comparison of means is more reliable than comparisons of values in the body of the table.

The difference between the control mean and the all treatments mean is not quite significant at P = 0.05. 5 mm covering produced a significant decrease in germination compared with 1 - 2 mm. Use of peat or peat/sand (means of both depths) resulted in significantly lower germination than control.

Table IV: Salvia: number (%) of seedlings with fully expanded cotyledons at the final count (15 days from sowing)

	Covering Materials						
		Peat/	Vermiculite		Coarse	Depth	Cont
Depth	Peat	sand	medium	coarse	sand	mean	mean
1-2 mm	82.00	84.67	90.33	90.33	79.67	85.40	-
5 mm	76.00	82.00	93.33	89.00	78.00	83.67	-
Mean	79.00	83.33	91.83	89.67	78.83	84.53	84.50

SED's: between uncovered (control) and covered (treatment) means = 2.20 (25df)
between depth of covering means = 1.79
between covering materials means = 2.84
between figures in the body of the table = 4.01

Because of variability in the experiment, comparison of means is more reliable than comparisons of values in the body of the table.

There were no significant differences between the control mean and the all treatment mean or the two depth means. The difference between peat or sand covering and medium vermiculite (mean of both depths) was highly significant at P = 0.05. Medium vermiculite significantly increased germination compared with control while the apparent reductions caused by peat or sand were almost significant.

Table V: Verbena: number (%) of seedlings with fully expanded cotyledons at the final count (15 days from sowing)*

	Covering Materials						
		Peat/	Vermiculite		Coarse	Depth	Cont
Depth	Peat	sand	medium	coarse	sand	mean	mean
1-2 mm	12.00	13.67	16.33	20.33	10.33	14.53	-
5 mm	24.00	29.33	17.67	33.33	13.67	23.60	-
Mean	18.00	21.50	17.00	26.83	12.00	19.07	14.33

* Owing to emergence being spread over a period of time, many seedlings did not have fully expanded cotyledons at the recording date. Mean total emergence at this time was 59%

SED's: between uncovered (control) and covered (treatment) means = 2.22 (25df)
between depth of covering means = 1.82
between covering materials means = 2.87
between figures in the body of the table = 4.06

Because of variability in the experiment, comparison of means is more reliable than comparisons of values in the body of the table.

The difference between the control mean and the all treatments mean was just significant at P = 0.05. 5 mm covering produced a highly significant increase in germination compared with 1 - 2 mm (means of all covering materials). Coarse vermiculite resulted in significantly higher germination than all other treatments except peat/sand (mean of both depths).

Conclusions from 1987 and 1988

The results in these trials were obtained in a germination room in which temperature and light levels were controlled. Moisture and humidity levels were also maintained by covering the seed trays with clear film plastic. In more variable environments, eg a glasshouse, the results might have been different.

Impatiens 1988: The generally accepted practice of not covering Impatiens seed was partly confirmed by this trial. Certainly a thick cover (5 mm) reduced germination compared with a thin cover (1 - 2 mm). However, a thin layer of course vermiculite significantly improved the germination of this species compared with the uncovered control. This could have been because it kept the seed moist while allowing sufficient light to penetrate to it.

Marigold 1987: None of the covering materials had a significant effect on germination compared with the uncovered control. A thick cover tended to reduce germination compared with a shallow cover but the latter, with the exception of sand, tended to improve germination compared with uncovered control.

Petunia 1987 and 1988: There were no significant differences in 1987. The only significant difference in 1988 was that 5 mm cover reduced germination compared with 1 - 2 mm. These results confirm the generally accepted practice of not covering Petunia seed.

Primrose 1988: 5 mm cover reduced germination compared with 1 - 2 mm (mean of all covering materials) and shallow layers of peat or peat/sand also tended to reduce germination. This result confirms the generally accepted practice of not covering Primrose seed.

Salvia 1987 and 1988: In both years, covering with coarse sand reduced germination compared with the uncovered control, suggesting that germination of Salvia seed requires some light.

Verbena 1987 and 1988: In both years, germination was improved by covering and 5 mm was better than 1 - 2 mm (mean of all covering materials) indicating that light may inhibit germination of this species.

In general, of the species tested, it appears that germination of Impatiens, Marigold, Petunia, Primrose and Salvia can be reduced by covering the seed particularly if thick layers of light-excluding materials, such as sand, are used but germination of Verbena will be improved by a thick (5 mm) cover.

Perhaps the most striking conclusion from this series of trials is the consistently good performance of coarse vermiculite as a seed cover. In every one of the nine trials done over the two year period, 1 - 2 mm of coarse vermiculite produced results as good as or better than the other covering treatments or the uncovered control treatments, even in those species where covering usually reduces germination. For Verbena the 5 mm cover of coarse vermiculite was better than 1 - 2 mm.

Bedding plant growers who currently use peat or sand to cover their seed could expect significantly better results if they used coarse vermiculite instead. A thin layer (1 - 2 mm) should be used on species (eg Salvia) which require light and a thicker layer (5 mm) on species (eg Verbena) which do not.