IMPROVED GERMINATION OF *ROSA CORYMBIFERA* 'LAXA' SEED USING A COMPOST ACTIVATOR

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Abstract. Autumn-harvested achenes of *Rosa corymbifera* 'Laxa' can be successfully germinated in the following spring if pretreated with a proprietary compost activator and stored under controlled conditions. The pretreatment used is 10g moist achenes, 25g moist vermiculite, 0.5g * ''Garotta'' compost activator, before storing at 20° C for 12 weeks and then at 4° C for 12 weeks. A series of experiments is described which shows that the time of harvest, rate of compost activator, proportion of vermiculite and storage temperatures can all be varied within given limits.

INTRODUCTION

Seeds of many rosaceous species show marked dormancy. This is a particular problem in the production of the rose rootstock, *Rosa corymbifera* 'Laxa' where dormancy results from a series of factors including a hard pericarp, chemical inhibitors, and physiological immaturity. Under natural conditions the achenes, (single-seeded fruits often referred to as ''seeds''), can take up to 18 months to germinate. Rootstocks produced in this way have a very variable grade-out because of erratic germination. Blundell and Jackson (1) were able to show that dormancy of the achenes could be broken if the pericarp was partially removed by scarification using concentrated sulphuric acid. Achenes treated with acid consistently had above 90% laboratory germination.

Commercial production of 'Laxa' rootstocks is now largely by acid scarification and is described in a U.K. Ministry of Agriculture leaflet (3). It is a complex process which initially involves separating the rose achenes from the hips and air drying. The achenes are then treated with concentrated sulphuric acid to remove most of the woody pericarp. After washing, the moist achenes are stored for 4 weeks at 20 to 24° C, followed by 12 weeks at 3 to 4° C. (These warm and cold temperature treatments probably facilitate physiological changes including the breakdown of inhibitors).

The process of acid scarification does require a degree of expertise. During the acid treatment, samples of achenes have to be sectioned and the end-point carefully assessed. The temperature of the acid-achene mixture also has to be carefully controlled as the heat generated can damage the living seed inside the achene. Thus,

* ''Garotta'' is produced by Sinclair Horticulture and Leisure Ltd, Firth Road, Lincoln LN6 7AH.)

although this method is useful for large-scale production of rose rootstocks, it is unlikely that the propagator, requiring relatively small numbers of seedlings, would employ the acid scarification technique. Natural stratification would be used as an alternative, where achenes are stored in moist sand and exposed to ambient temperatures for 12 to 18 months. The germination rate after natural stratification is low and varies from approximately 7 to 15% (3).

When rose achenes are dispersed naturally the hard pericarp is exposed to microbial decay in the soil, causing the pericarp to be weakened and inhibitors to be degraded or leached. Acid scarification probably mimics parts of this process. Normally the rate of microbial decay will vary among achenes but will be greatest in the warmer months of the year when microbial activity is higher. Achenes dispersed naturally in the autumn may not start to decay appreciably until the following summer, thereby accounting for the erratic field emergence observed.

As an alternative to acid scarification investigations in both the laboratory and field were undertaken to see if the microbial decay of the achenes could be advanced by storing the moist seed at warm temperatures and adding a proprietary compost activator (our trial used "Garotta") to encourage microbial action. The normal cold temperature treatment of 12 weeks at 3 to 4 °C was then given. For this method to be considered successful a useful percentage of achenes harvested in autumn should germinate when sown in mid-March of the following year. If sowing is delayed to later in the spring then the higher seedbed temperatures prevailing at the time of sowing may induce secondary dormancy (2).

MATERIALS AND METHODS

All achenes used were harvested from *R. corymbifera* 'Laxa' stock plants grown at Writtle Agricultural College. The hips were crushed before being left to soften in water for about one week. Sieves were used to separate the achenes. Achenes were not normally dried before use. During all treatments the achenes were mixed with moist vermiculite (medium grade) prepared by adding 400 ml deionised water to 250g vermiculite and stirring thoroughly. Normally 25g moist vermiculite was used for each 10g 'Laxa' achenes and the compost activator was added as required. The mixture was stored in a polythene bag, tied loosely to admit air, and then weighed. Each week during both the warm and the cold treatments the bags were shaken to aerate the contents and returned to their original weights by adding deionised water.

Following a cold storage treatment, laboratory germinations were determined by placing the achenes in Petri dishes containing

moist filter paper. These were maintained at 15 °C and germination (radicle emergence) was recorded regularly. Field emergence was measured by sowing achenes into a seedbed treated the previous autumn with the soil-sterilant, dazomet, then covering with a layer of 4 to 6 mm gravel to prevent capping.

All treatments had four replicates and the laboratory germination and field emergence tests were fully randomised. Resulting data were subjected to an analysis of variance.

EXPERIMENT 1: Effect of the compost activator on moist achenes:

Harvest date:	25 September 1986
Treatments commenced:	2 October 1986
Treatment 1	10g achenes + 25g moist vermiculite, 12 weeks at 20° C then 12 weeks at 4° C
Treatment 2	10g achenes + 25g moist vermiculite + 0.5g "Garotta" 12 weeks at 20° C then 12 weeks at 4° C
Treatment 3	10g achenes + 25g moist vermiculite + 1.0g "Garotta" 12 weeks at 20° C then 12 weeks at 4° C

Treatments completed: 17 March 1987—then laboratory germination and field emergence measured (see Tables 1 and 2 of Results).

EXPERIMENT 2: Effect of harvest date on compost activator treatment

Harvest dates:	24 September 1987. (Treatment 1) 21 October 1987. (Treatment 2) 19 November 1987. (Treatment 3)
Treatments commenced:	30 September 1987. (Treatment 1) 28 October 1987. (Treatment 2) 25 November 1987. (Treatment 3)
Treatment 1	10g moist achenes + 25g moist vermiculite + 0.5g "Garotta"; 12 weeks at 20° C then 12 weeks at 4° C
Treatment 2	10g moist achenes + 25g moist vermiculite + 0.5g "Garotta"; 8 weeks at 20° C then 12 weeks at 4° C
Treatment 3	10g moist achenes + 25g moist vermiculite + 0.5g "Garotta"; 4 weeks at 20° C then 12 weeks at 4° C

Treatments completed 25 March 1988—then laboratory germination measured (see Table 3 of Results).

EXPERIMENT 3: Effect of temperature during warm treatment

Harvest date:	21 October 1987
Treatment commenced:	28 October 1987
Treatment 1	10g moist achenes + 25g moist vermiculite + 0.5g "Garotta"; 8 weeks at 20° C then 12 weeks at 4° C
Treatment 2	10g moist achenes + 25g moist vermiculite + 0.5g "Garotta"; 8 weeks at 25° C then 12 weeks at 4° C
Treatment 3	10g moist achenes + 25g moist vermiculite + 0.5g "Garotta"; 8 weeks at 30° C then 12 weeks at 4° C

Treatments completed 25 March 1988—then laboratory germination measured (see Table 4 of Results).

EXPERIMENT 4: "Commercial" treatment of achenes with a compost activator at normal and half-rate of vermiculite

Harvest date:	24 September 1987
Treatments commenced:	30 September 1987
Treatment 1	500g moist achenes + 1250g moist vermiculite + 25g "Garotta"; 12 weeks at 20° C then 12 weeks at 4° C
Treatment 2	250g moist achenes + 313g moist vermiculite + 12.5g "Garotta"; 12 weeks at 20° C then 12 weeks at 4° C

Treatments completed 25 March 1988—then laboratory germination measured (see Table 5 of Results).

RESULTS

EXPERIMENT 1: Effect of the compost activator on moist achenes

Table 1. Laboratory germination of 25 achenes/replicate after 13 days, from treatments with and without the compost activator.

Replicate	1	2	3	4	Percent
Treatment 1 (control)	1	0	1	0	2 (a)
Treatment 2 (0.5g Garotta)	21	20	15	20	76 (b)
Treatment 3 (1 0g Garotta)	21	21	20	21	83 (b)

(a) and (b). Different letters indicate significant difference at 99% confidence.

Table 2. Field emergence of 100 achenes/replicate after 2 months, from treatments with and without the compost activator.

Replicate	1	2	3	4	Percent
Treatment 1 (control)	32	21	23	28	26.0 (a)
Treatment 2 (0.5g Garotta)	39	36	42	69	46.5 (b)
Treatment 3 (1.0g Garotta)	47	39	38	51	43.7 (b)

(a) and (b) different letters indicate significant difference at 95% confidence.

EXPERIMENT 2: Effect of harvest date on compost activator treatment

Table 3. Laboratory germination of 50 achenes/replicate after 14 days, of achenes harvested at different dates with the compost activator.

Replicate	1	2	3	4	Percent
Treatment 1 (harvested Sept.)	48	47	43	45	91.5 (a)
Treatment 2 (harvested Oct.)	46	33	48	47	87.0 (a)
Treatment 3 (harvested Nov.)	43	47	40	40	85.0 (a)

(a) same letter indicates no significant difference.

EXPERIMENT 3: Effect of temperature during warm treatment

Table 4. Laboratory germination of 50 achenes/replicate after 14 days from achenes given different warm temperature treatments with the compost activator.

Replicate	1	2	3	4	Percent
Treatment 1 (20° C)	46	33	48	47	87.0 (a)
Treatment 2 (25° C)	46	48	49	47	95.0 (a)
Treatment 3 (30° C)	44	46	49	38	88.5 (a)

(a) same letter indicates no significant difference.

EXPERIMENT 4: "Commercial" treatment of achenes with a compost activator at normal and half-rate of vermiculite

Table 5. Laboratory germination of 25 achenes/replicate after 14 days from "commercial" treatment of achenes at normal and half-rate of vermiculite

Replicate	1	2	3	4	Percent
Treatment 1 (Normal Rate Vermiculite)	25	23	19	21	88.0 (a)
Treatment 2 (Half Rate Vermiculite)	23	20	23	21	87.0 (a)

(a) same letter indicates no significant difference.

DISCUSSION

The use of a compost activator to enhance the germination of *R. corymbifera* 'Laxa' achenes gives results broadly comparable to published results for acid scarification (1). Although the time of treatment is longer when a compost activator is used there are two stages fewer than are needed for acid scarification, i.e. air drying plus acid treatment. In addition, the experiments described above show that the technique does not require particular expertise or exact conditions. The time of harvest, rate of compost activator, proportion of moist vermiculite, and storage temperature can all be varied within the limits shown without a profound effect on the success of the technique. At Writtle *R. corymbifera* 'Laxa' rootstocks are produced by harvesting achenes in late September, and treating them in the proportion of 10g moist achenes, 25g moist vermiculite, 0.5g "Garotta", before storing at 20° C for 12 weeks and 4° C for 12 weeks. Achenes are then ready to be sown in late March. Figure 1 shows that this method has produced consistent results over a four year period.

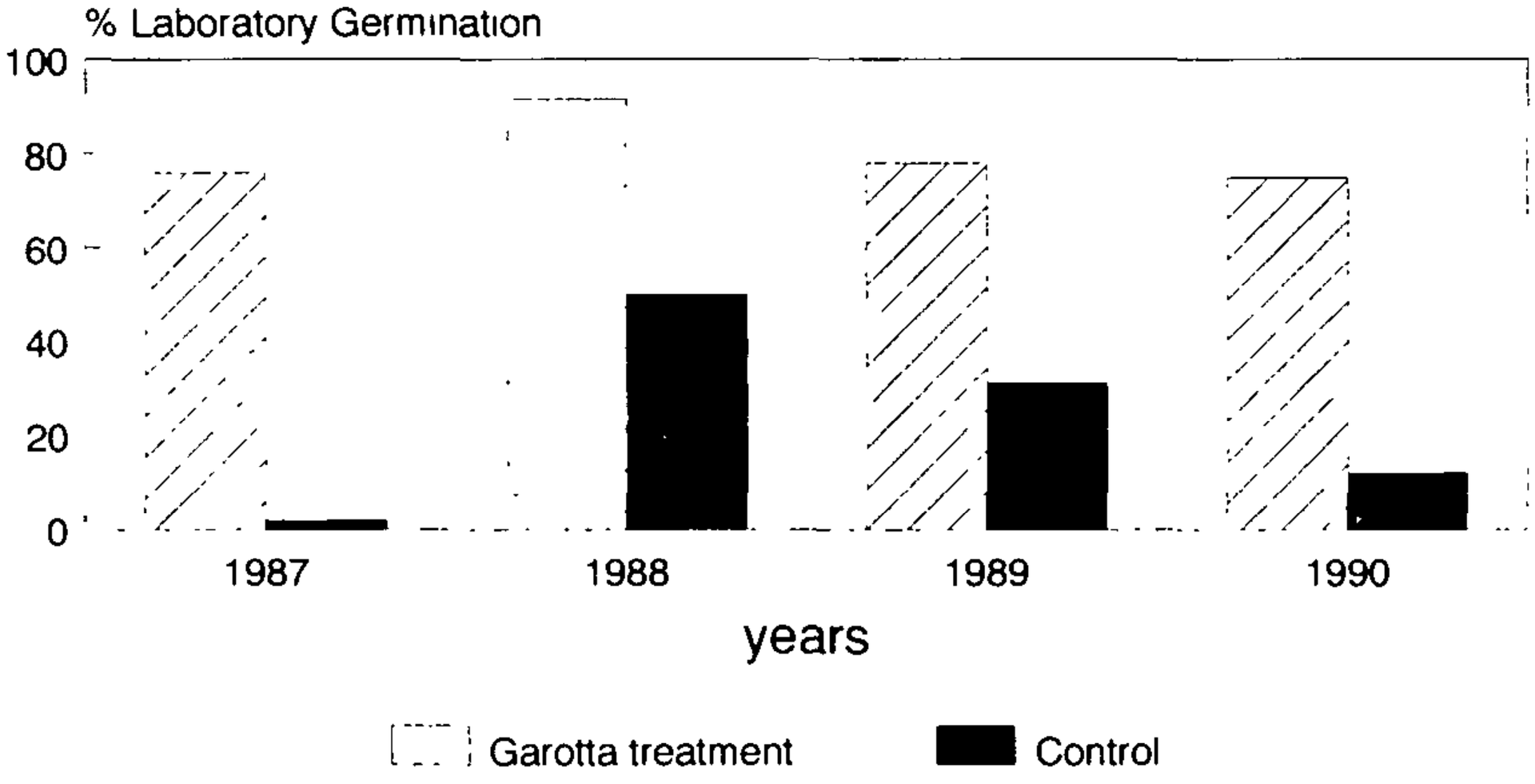

Figure 1. Laboratory germination (14 days) of "Garotta"-treated achenes compared to warm and cold-treated achenes over a 4 year period.

The action of the compost activator on the achenes has yet to be fully investigated. Achenes treated with "Garotta" darken more quickly and have a softer pericarp by the end of the warm treatment. The composition of "Garotta" is a "trade secret". Possibly the achenes could be supplied with a nitrogen source to encourage microbial activity. However, this product is widely available in the United Kingdom and it is the authors' belief that this technique could readily be used for production of *R. corymbifera* 'Laxa' rootstocks.

LITERATURE CITED

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