# FIRST SESSION

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## ROSE ROOTSTOCKS — PERFORMANCE AND PROPAGATION FROM SEED

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This review will be in the form of a progress report.

GERMINATION OF SEEDS — About 350 B.C., Theophrastus reported that germination of rose seed was very slow and erratic so that, in order to avoid delay, cuttings were made. Some 450 years later, Pliny mentioned that rose seed germination was a very slow process. Here am I, about 2,300 years later, agreeing with both these learned gentlemen and one wonders just how slow progress can be!

The so-called "seed" found in rose hips is really a fruit and in many species, such as *Rosa canina*, such "seed" lies dormant for many months before germination takes place. If it were possible to control this dormancy, one would be nearer to being able to control the plant density in the field which, in turn, should lead to more uniform rootstock production.

*Source of Seed* — For the current work at Luddington Experimental Horticulture Station, homeproduced seed is being used. The seed from different bushes of wild *R. canina* is likely to behave differently, so hedges of various commercial selections have been planted.

The work of Rowley at the John Innes Institute, suggested that hips of *R. canina* should be firm and then picked as soon as ripe. In October, 1967, hips of *R. canina* 'Inermis' were obtained from the National Agricultural Advisory Service Centre at Shardlow. After suitable treatment, a field germination of 37% was obtained in the spring of 1968. The first hips from a hedge at Luddington were saved in autumn, 1968, but were comparatively unripe even when picked on 18th November and the response to treatment was very disappointing. *R. corymbifera* (*R. dumetorum*) 'Laxa' seed has responded well when taken from both firm and from squashy, over-ripe hips.

*Seed Treatment* — After consulting the relevant literature, it was decided to concentrate our studies mainly on the effect of temperature.

*R. canina* 'Pfander' has not responded to any treatment. *R. canina* 'Inermis' has been good one year and a failure the next. *R. corymbifera* (*R. dumetorum*) 'Laxa' has given 12%, 62% and 12% field germination in the three years of the trial when subjected to a storage treatment of 8 weeks at 70°F and 12 weeks at 39°F.

*Stratifying Media* — During the storage period it is essential to keep the seed moist and in the main work at Luddington vermiculite was used as suggested by Rowley. In 1969 three different media were used. Vermiculite was better than peat or sand.

*Other Factors* — Research work by Jackson and Blundell at Bangor has given interesting results and the part played by the pericarp has been investigated. The use of concentrated sulphuric acid to aid germination of difficult seeds is well known. Soaking seeds in acid for half an hour, or for one hour prior to storage treatments had no effect on seed germination for *R. canina* 'Inermis' or for *R. corymbifera* (*R. dumetorum*) 'Laxa' at Luddington. Similarly, treatment with gibberellic acid and thiourea prior to storage failed to help in breaking dormancy. With the seed used at Bangor greater success was obtained with sulphuric acid.

With rose rootstock work currently being carried out in Ireland, Scotland, Wales and England, one is optimistic that more control over the germination process will ultimately become possible. In the case of some rootstocks, such as *R. multiflora* and *R. rugosa*, some seeds germinate the first spring after being harvested. The field emergence of seedling rarely ties up with laboratory germination tests and the number of saleable rootstocks is only a fraction of the number of seed sown.

*Field Emergence* — At Luddington in 1969, laboratory germination tests were made on samples after various treatments and then counts were made on field emergence. The results, as percentages were as follows:—

| | Laboratory | Field |
|---|---|---|
| *R. multiflora* | 67 | 9 |
| *R. corymbifera* (*R. dumetorum*) 'Laxa | 25 | 17 |
| *R. rugosa* | 37 | 20 |
| *R. canina* 'Inermis' | 0 | 2 |
| *R. canina* 'Pfander' | 1 | 5 |

*Herbicides* — Chemical weed control is almost essential. The use of 3.9 lb. propachlor (as 6 lb. Ramrod) *or* 1.0 lb. lenacil (as 1.2 lb. Venzar) in 100 gallons per acre gave good results as a pre-emergence herbicide in 1968 but the results are not so clear cut in 1969. The number of *R. multiflora* seedlings appears to be reduced. Noruron at 1.6 lb. active ingredient (2.0 lb. commercial product) also looks promising but we must wait until the crop is lifted before drawing any conclusions. It gave good weed control. Post-emergene materials being tried are simazine, 0.5 lb.; lenacil, 1.0 lb.; and phenmedipham, 1.0 lb. None of these materials has reduced seedling count.

*Mildew* — This can be very troublesome on young seedlings; 5.7 lb. sulphur, as 6 lb. Electrosulph; and 0.25 lb. quinomethionate, as 1 lb. 25% Morestan, gave good results in the trial on *R. canina* but the latter material caused partial defolia-

tion of *R. multiflora* when sprayed in the field. Of the newer materials being tried, 3.7 oz. beonmyl (as 7.5 oz. 50% Benlate) was quite promising.

## EVALUATION OF ROSE ROOTSTOCKS

Few experiments have been carried out in this country but there are some running at present. Rowley planted some trials at the John Innes Institute and included some plants on their own roots but many of these failed to establish themselves. Trials are in progress at the Glasshouse Crops Research Institute and 13 different rootstocks are being tested in a series of trials at Merrist Wood in Surrey, Shardlow in Derbyshire, and at Luddington in Warwickshire. At the last three centres, a two-year nursery cycle is being repeated on three occasions in the hope that a variety of climatic conditions will be experienced. The stocks and budwood are from common sources for all centres.

Stocks 5-8 mm in size were planted in late winter 1967, 1968 and 1969, but as only one crop has been lifted to date, what follows can only be regarded as a progress report. These records give information on the relative ease of handling the stock.

Table 1. Dormant stage evaluation

| Rootstocks (dormant stocks as purchased, 1968) | No of shoots | *No of thorns | Collar length (in ) |
|---|---|---|---|
| *R. corymbifera* (*R. dumetorum* 'Laxa' | 2.2 | 0.0 | 1.6 |
| *R. micrantha* (*R. rubiginosa*) | 1.9 | 5.0 | 1.4 |
| *R.* 'Superbe' | 1.6 | 0.0 | 1.6 |
| *R. multiflora* 'Inermis' | 1.3 | 0.0 | 1.3 |
| *R. multiflora* 'Japonica' | 2.7 | 0.0 | 1.2 |
| *R. canina* 'Succes' | 2.3 | 0.9 | 1.0 |
| *R. canina* 'Pfander' | 2.3 | 0.0 | 1.8 |
| *R. canina* 'Inermis' | 2.4 | 0.0 | 1.5 |
| *R. canina* 'Heinsohn's Rekord' | 1.8 | 0.2 | 1.6 |
| *R. canina* 'Wild' | 2.8 | 1.8 | 1.5 |
| *R. canina* 'Schmid's Ideal' | 2.4 | 3.0 | 1.4 |
| *R. canina* 'Brogs' | 3.8 | 0.0 | 1.4 |
| *R. canina* 'Pollmers' | 2.4 | 0.3 | 1.3 |

* 0 = nil  5 = very thorny

Measurements have been taken and quality varied a little from year to year. The thorns at this stage are generally small and are not troublesome in most stocks. *R. micrantha* (*R. rubiginosa*) however is always very thorny. *R. canina* 'Schmid's Ideal' was quite thorny in 1968 but much smoother in 1969.

The number of shoots per stock varies from season to season and collar length has also varied but the two *R. multiflora* stocks included have always been the shortest.

*Establishment of rootstocks* — At Luddington, establishment was generally better on sandy loam than on clay soil. In 1968, a dry spring, *R. micrantha* (*R. rubigiginosa*) both *R. multiflora* stocks, and *R.c.* 'Heinsohn's Rekord' did not establish as well as the others in spite of irrigation. In 1969, *R. multiflora* and *R. micrantha* (*R. rubiginosa*) again did not establish very well, but 'Heinsohn's Rekord' did not suffer any losses.

*Summer growth and ease of budding* — Ease of budding is affected by thorns, type of growth and bark thickness.

Table 2. Growth characteristics at budding time

| Variety | Habit | Ease of Collection | Collar | Ease of Access | Bark | Ease of Budding |
|---|---|---|---|---|---|---|
| *R. canina* 'Heinsohns Rekord' | Straggly | Easy | Medium | Good | Thin | Easy |
| *R. canina* 'Inermis' | Thin | Easy | Medium | Good | Thick | Easy |
| *R. corymbifera* (*R. dumetorum*) 'Laxa' | Compact | Easy | Medium | Good | Good | Easy |
| *R. canina* 'Superbe' | Bushy | Easy | Medium | Good | Good | Easy |
| *R. canina* 'Brogs' | Bushy | Fair | Medium | Good | Good | Fairly Easy |
| *R. canina* 'Pfander' | Open | Easy | Long | Good | Good | Fairly Easy |
| *R. canina* 'Pollmers' | Stiff | Easy | Medium | Fair | Good | Fairly Easy |
| *R. canina* 'Schmids Ideal' | Bushy | Fair | Medium | Fair | Good | Fairly Easy |
| *R. canina* 'Wild' | Upright | Fair | Medium | Fair | Good but variable | Fairly Easy |
| *R. multiflora* 'Inermis' | Vigorous Spreading | Difficult | Short | Difficult | Good | Fairly difficult |
| *R. multiflora* 'Japonica' | Vigorous | Difficult | Short Fat | Difficult | Good | Fairly difficult |
| *R. micrantha* (*R. rubiginosa*) | Stiff | Easy | Medium | Fair | Fair | Difficult |
| *R. canina* 'Succes' | Stiff | Difficult | Medium | Poor | Variable | Difficult |

"Ease of collection"; in the above table, refers to the ease or difficulty with which the growth can be handled to expose the collar for budding purposes. Having exposed the collar, some stocks are still rather troublesome as stiff, thorny

growth, a multi-branching head, or surface rooting makes successful budding difficult.

*Budding Season* — Assessments of "buddability" were made at frequent intervals from the end of May. At Ludding-ton, no buds were inserted but T cuts were made to discover if the bark was in good condition and "running" well. In 1967, buds could have been inserted in all stocks from 2nd June until 15th September and for a further week at the end of the season for *R. c.* (*R. d.*) 'Laxa', *R. canina* and *R. canina* 'Inermis'. In 1968, all stocks were satisfactory until the end of September but the fact that the bark could be lifted well, does not mean that budding would necessarily have been successful.

The results from Shardlow were similar to those at Luddington but the Merrist Wood trial was different. In 1967 buds were easily inserted from 2nd June to 8th September with the exception of *R. corymbifera* (*R. d.*) 'Laxa' *R. c.* 'Superbe' and *R. c.* 'Succes' which were only moderately easy during a dry period. In 1968, almost all were easily buddable from 14th June until 9th August after which many began to deteriorate. The two *R. multiflora* stocks, 'Heinsohns Rekord', 'Pfander' and *R. canina* 'Inermis' were good until the end of September. 'Brogs', 'Schmids Ideal' and *R. micrantha* (*R. rubiginosa*) were slower in starting and *R. c.* 'Pollmers' began to dry up towards the end of July.

*Precocity* — Measurements of maiden growth were taken early in the season. Some rootstocks, such as *R. multiflora*, produce quicker growth than others and at the lower end of the scale, R. canina 'Superbe' was slowest. "Blow-outs" can be associated with precocious growth. *R. multiflora* is bad in this respect. There was an indication at Merrist Wood in 1968 from the weekly budding trial that the 1967 earliest-inserted buds were less prone to "blowing-out" as maidens. Where maiden growth is pinched when about 4 inches long, "blowing-out" is considerably reduced.

*Suckers* —

Table 3. Suckers per plant, 1968

| | Luddington | Shardlow | Merrist Wood | Mean |
|---|---|---|---|---|
| *R. c.* 'Laxa | 0.5 | 0.1 | 0.6 | 0.4 |
| *R. multiflora* | 0.9 | 0.3 | 2.5 | 1.2 |
| *R. c* 'Pfander' | 1.2 | 0.4 | 1.3 | 1.0 |
| *R. c.* 'Heinsohns Rekord' | 1.2 | 0.3 | 3.4 | 1.6 |
| *R. c.* 'Superbe' | 1.3 | 0.3 | 2.3 | 1.3 |
| *R. m.* 'Inermis' | 1.6 | 0.0 | 2.5 | 1.4 |
| *R. c.* 'Inermis' | 2.5 | 1.2 | 1.8 | 1.8 |
| *R. micrantha* (*R. rubiginosa*) | 3.3 | 0.8 | 7.0 | 3.7 |
| *R. c.* 'Succes' | 4.2 | 1.3 | 5.4 | 3.6 |
| *R. canina* | 4.3 | 1.0 | 4.4 | 3.2 |

The previous table shows the results of one year's study only; *R. canina, R. canina* 'Succes' and *R. micrantha* (*R. rubiginosa*) seem very liable to sucker while *R. c.* (*R. d.*) 'Laxa' is very free from suckering.

*Flowers* —

Table 4. Number of flowers: summer of maiden year

| | Luddington | Shardlow | Merrist Wood | Mean |
|---|---|---|---|---|
| *R. multiflora* 'Inermis' | 14 | 8 | 10 | 11 |
| *R. multiflora* | 14 | 7 | 8 | 10 |
| *R. c.* 'Pfander' | 11 | 6 | 5 | 7 |
| *R. c.* 'Heinsohns Rekord' | 11 | 6 | 8 | 8 |
| *R. c.* 'Inermis' | 11 | 7 | 7 | 8 |
| *R. c.* 'Laxa' | 10 | 6 | 5 | 7 |
| *R. c.* 'Superbe' | 10 | 6 | 6 | 7 |
| *R. micrantha* (*R. rubiginiosa*) | 10 | 6 | 7 | 8 |
| *R. c.* 'Succes' | 9 | 6 | 10 | 8 |
| *R. canina* | 8 | 5 | 5 | 6 |

In the middle of the summer of the maiden year, the two *R. multiflora* stocks were the most floriferous, whereas *R. canina* had fewest buds, flowers and dead flowers. It does not follow that the behaviour will remain the same after the maiden year, as the ultimate size of the bush will vary.

*Number of shoots produced* —

Table 5. Average number shoots at lifting time

| | Merrist Wood | Luddington | Shardlow | Mean |
|---|---|---|---|---|
| *R. multiflora* | 4.4 | 4.6 | 4.7 | 4.6 |
| *R. multiflora* 'Inermis' | 4.5 | 4.9 | 4.1 | 4.5 |
| *R. c.* 'Heinsohns Rekord' | 4.0 | 3.9 | 3.9 | 3.9 |
| *R. c.* 'Inermis' | 3.0 | 3.8 | 4.0 | 3.6 |
| *R. c.* 'Superbe' | 3.4 | 3.3 | 3.8 | 3.5 |
| *R. c.* 'Plander' | 3.1 | 3.6 | 3.7 | 3.5 |
| *R. micrantha* (*R. rubiginosa*) | 3.1 | 3.2 | 3.9 | 3.4 |
| *R. corymbifera* 'Laxa' | 3.2 | 3.3 | 3.7 | 34 |
| *R. canina* | 3.2 | 3.1 | 3.8 | 3.4 |
| *R. c.* 'Succes' | 2.7 | 2.8 | 3.3 | 2.9 |

*Rosa canina* 'Succes' gave the fewest number of shoots and therefore the poorest grade at all centres. The two *R. multiflora* stocks produced most branches and *R. c.* 'Heinsohns Rekord' also did well. *R. c.* 'Inermis' performed well at two centres but gave poor results at Merris Wood.

The two cultivars used were generally affected in a similar way by the various rootstocks although 'Peace' was ninth in vigour on *R. c.* 'Pfander' whereas 'Ena Harkness' was fourth on the same rootstock.

Table 6. Average height at lifting, inches

| | Merrist Wood | Luddington | Shardlow | Mean |
|---|---|---|---|---|
| *R. multiflora* | 26.7 | 28.9 | 24.7 | 26.8 |
| *R. m.* 'Inermis' | 25.5 | 28.0 | 24.4 | 25.9 |
| *R. c.* 'Inermis' | 24.6 | 28.1 | 24.1 | 25.6 |
| *R. c.* 'Pfander' | 23.7 | 28.8 | 24.2 | 25.6 |
| *R. c.* 'Heinsons Rekord' | 25.3 | 27.0 | 23.5 | 25.3 |
| *R. corymbifera* 'Laxa' | 22.6 | 27.4 | 23.6 | 24.5 |
| *R. c.* 'Succes' | 24.5 | 26.5 | 22.9 | 24.6 |
| *R. micrantha* (*R. rubiginosa*) | 24.9 | 25.1 | 22.8 | 24.2 |
| *R. c.* 'Superbe' | 24.0 | 24.3 | 23.0 | 23.8 |
| *R. canina* | 22.1 | 26.1 | 22.6 | 23.6 |

*R. corymbifera* 'Laxa' did less well at Merrist Wood than at other centres and there was far less uniformity of growth. In all trials, the two *multiflora* stocks produced the tallest plants.

SUMMARY —

With only the first of three nursery cycles completed, it would be wrong to draw definite conclusions but certain points are worth noting.

*R. canina* 'Succes'. Does not look at all promising. Difficult to handle and bud, large number of suckers. Comparatively few flowers. Susceptible to "blow-out". Insufficient numbers of grade 1 plants having three or more strong shoots.

*R. micrantha (R. rubiginosa.)* Very thorny and difficult. Numerous suckers. Does not appear to have sufficient good points to overcome the bad ones.

*R. canina.* This very popular stock has not performed very well in the first trial. It was one of the less vigorous stocks, produced rather a lot of suckers and few flowers in the first summer.

*R. multiflora* and *R. multiflora* 'Inermis'. The most vigorous stocks in the trial; produced most blooms in the first flush. Not many suckers but they have a comparatively short, fat neck and multi-branched head and tend to be surface rooting. These factors can hinder budding when 5-8 mm grade stocks are budded in July. Susceptible to "blow-out" unless maiden shoots are pinched. Not too easy to head-back due to thick, short neck.

*R. corymbifera* (*R. dumetorum*) 'Laxa'. An easy stock to bud giving reasonable vigour but growth was variable at Merrist Wood. Suckering was negligible. The number of flowers was a little below average for all the rootstocks in the trial. Easy to head-back; buds clearly visible and wood soft.

*R. canina* 'Inermis'. Virtually thornless and easy to bud. It graded well at Luddington and Shardlow but not so well at Merrist Wood. Flower number satisfactory. Fairly rapid growth in spring at Luddington and needs pinching to reduce "blowing-out". It has more suckers than some of the other *canina* selections.

*R. canina* 'Heinsohns Rekord'. The stock has rather a straggly habit but is comparatively easy to bud, even though the bark was rather thin in 1968. Produced a good number of shoots at all centres and would grade well. Suckering variable, being fairly high at Merrist Wood. Average number of flowers. The rootstock is very susceptible to mildew attack.

*R. canina* 'Pfander'. Few suckers; very susceptible to mildew. Fairly easy to bud. Average number of blooms but did not grade out quite as well as 'Heinsohns Rekord'. Some black spot disease on odd plants. Stock has an open habit and sends up tall shoots, somewhat arching.

*R. canina* 'Superbe'. Fewer than average flower number. Graded reasonably well but bushes below average height. Not many suckers. Early growth of stock tends to be a little straggly but later a bushy habit develops. An occasional leaf with black spot disease. Not particularly easy to head-back.

PETER VERMEULEN: Has anyone investigated the reasons why some seeds germinate in the first year whilst others take two years or longer?

A. R. CARTER: The pericarp of the seed contains an inhibitor which prevents germination. In some seeds this inhibitor disappears more quickly than in others; if you take the pericarp off you remove the inhibitor. Work is now in progress to attempt this by chemical means.

ROBERT GARNER: Have you tried washing the seed frequently in order to remove the inhibitor? For fruit seeds such as apple I have succeeded in getting germination within two or three weeks instead of having to wait a full season. This was done by dropping the seed into water which was changed daily for a week or ten days. It might even be possible to do this job

in a washing machine on a larger scale though I have not attempted it.

A. R. CARTER: I have not tried that technique, but other workers have tried washing the seed.

JAMES WELLS: If seed is picked immaturely would it improve germination?

A. R. CARTER: We are trying different stages from green to deep red; we may have more information next year.

JAMES WELLS: I am surprised to hear that *R. multiflora* is not hardy. It is the basic understock in the USA, where temperatures are much lower than here.

A. R. CARTER (and other speakers) stressed that the depth of cane dormancy may depend upon autumn ripening and emphasized that it was the new growth that was damaged.

## WORK FLOW IN THE PRODUCTION DEPARTMENT OF THE NURSERY

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Before production efficiency and rationalisation can take place, a number of basic factors to any business must be considered. Production must be related to the type of business in which the nurseryman is engaged; for example, the requirements of a retail company might be quite different than those of a wholesale company and a company engaged in both wholesale and retail trading would again vary from the previous two. The basic marketing techniques of garden centres and mail orders may profoundly influence the approach towards production. It is scarcely necessary for me to expand further upon these major factors.

Production for our retail trade is geared towards the propagation of a vast range of plants, generally in fairly small numbers, whereas the wholesale grower is normally engaged in the production of a fairly small range of plants in vast numbers. If the business is entirely orientated towards a garden centre, or more than one garden centre, or if it is a wholesale business which is aiming to produce garden centre type products, then containerisation will be involved, resulting in a quite different production chain or flow pattern than that of an open ground plant. The production cycle in the nursery will be profoundly influenced by management policy towards production, whether or not home production is favoured or whether plants are purchased at some stage in their development.

The factors which I have mentioned so far mainly come under the jurisdiction of nursery management at its highest level; in other words, the owner or the directors. The question of management policy towards production, once the basic principles of the type of outlet have been settled, is often in-