

CLONAL SELECTION OF HARDY ORNAMENTAL NURSERY STOCK

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Abstract. Recent progress and changes made to the "Clonal Selection Scheme" for Hardy Ornamental Nursery Stock are outlined. Since the project commenced in 1975 eleven subjects have been selected and released to the trade. Over 115 different species or cultivars are currently undergoing assessment and it is planned to increase the rate of release to approximately eight selections per year.

INTRODUCTION

Reports (1,2) in previous IPPS Proceedings have described the initiation and early progress of a U.K. selection scheme for hardy ornamental nursery stock. This paper describes recent changes in the organisation of the scheme (usually referred to as the "Clonal Selection Scheme" or C.S.S.), and lists plants so far selected and outlines plans for a more comprehensive system of assessment in the future.

ORGANISATION OF THE C.S.S.

As a result of reorganisation of research and development by the Agricultural and Food Research Council, work on hardy ornamental plant selection was transferred from Long Ashton Research Station to East Malling Research Station in 1983.

At the time of transfer small changes in the organisation of the C.S.S. were implemented to facilitate smoother running of the scheme and plans were made to extend the aims and objectives of the scheme.

The operation of the C.S.S. is best described by considering the procedures as two sequential stages of selection.

STAGE I

The first stage of the C.S.S. involves the propagation, sorting, and initial evaluation of plant material collected from as many sources as possible. This is followed by the propagation and distribution back to the nursery trade of one or more preliminary selections which, as well as being true to type, exhibit superior growth and performance (Figure 1).

Subjects nominated for evaluation. Nurserymen, amenity, and other professional horticulturists and botanists have been invited by East Malling Research Station to provide lists of hardy ornamental tree and shrub subjects which they believe

warrant inclusion in the C.S.S. Of particular interest are economically important subjects which tend to vary in characteristics such as growth or flowering when obtained from different sources. After discussion and approval by a small committee of researchers, nurserymen, and other professional horticulturists (the Clonal Selection Committee) a timetable is drawn up to collect and test the nominated subjects.

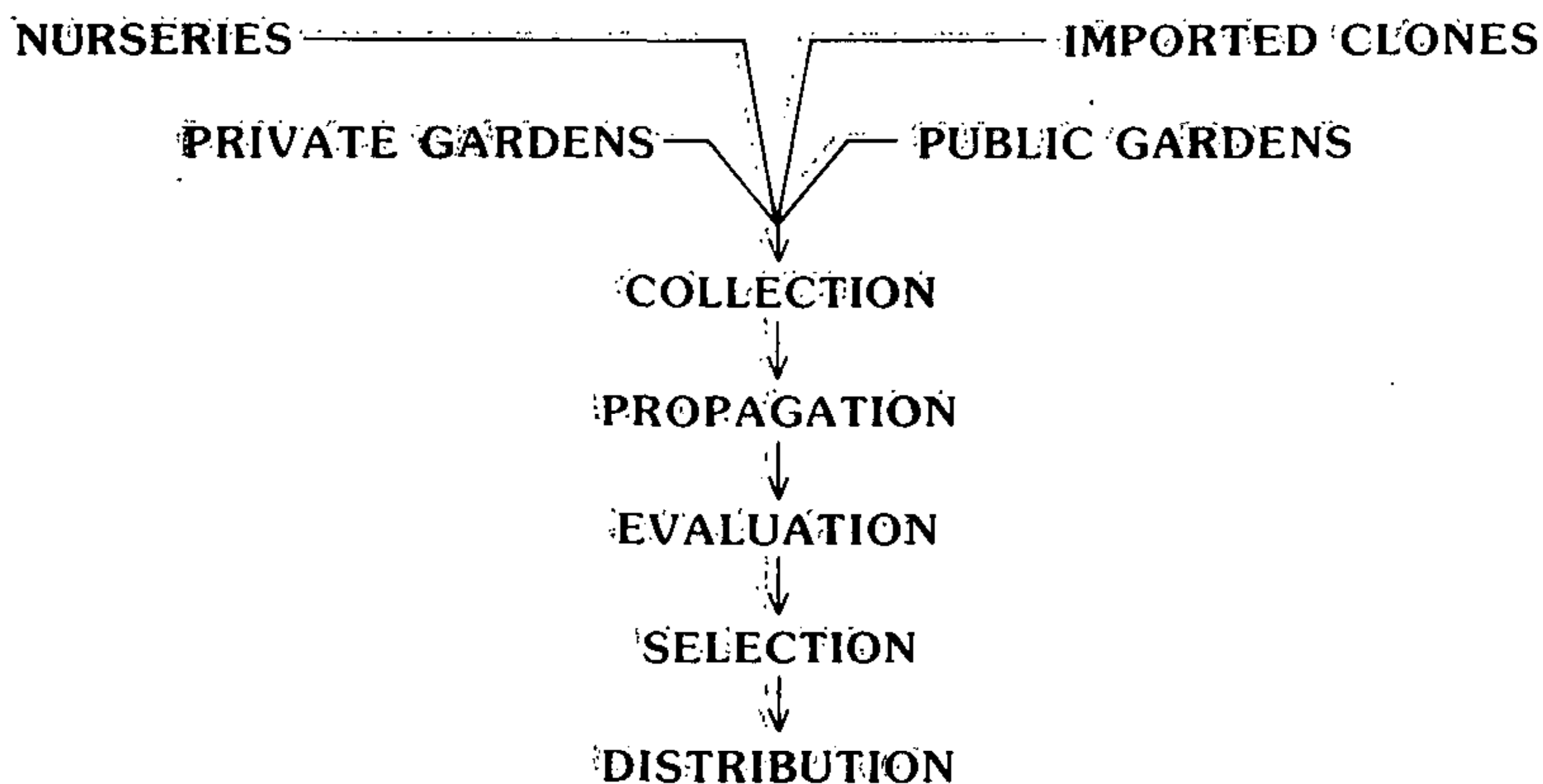


Figure 1. The East Malling Research Station Selection Scheme

Collection of plants. The collection of propagules or plants is undertaken by inviting donation of the nominated subjects from:

- | | |
|----------------------------|-------------------------------|
| Commercial nurseries | Horticultural Colleges |
| Private gardens | Other Plant Selection Schemes |
| National Trust properties | in the UK and abroad |
| Botanic Gardens | Breeding programmes in the |
| National Plant Collections | UK and abroad |

Currently the majority of material is being donated by sources other than commercial nurseries.

Regional co-ordinators, including ADAS Horticultural Officers, are now involved in ensuring that material is collected and transferred to East Malling as quickly as possible and in a condition suitable for propagation. In the past some consignments of material have been in poor condition on arrival at EMRS with the inevitable result that propagation has been poor. Wherever possible rooted plants are requested as these are less liable to deteriorate in transit and evaluation can be undertaken more speedily.

Propagation. The propagation of material received is carried out using those techniques most appropriate to ensure success. Many plants sent to East Malling as rooted or unrooted cuttings are variable in size and may be received over

several months. Following initial propagation and/or growing-on, it is necessary therefore to repropagate plants from all the sources under standard conditions to ensure uniformity of treatment prior to the commencement of plant evaluation. Although this repropagation procedure delays evaluation it may facilitate the comparison on various methods of propagation, e.g. fogging, mist, and polythene and it has also highlighted the need for research into improved propagation techniques for specific subjects.

Many tree subjects are received as budwood or graftwood and similar problems of variability of scionwood quality, and condition of receipt may, as with cuttings, necessitate subsequent repropagation. A further problem with many tree subjects is that only seedling rootstocks are available. It is of some concern that lack of uniformity in such rootstocks may result in differences in the rootstock influence on scion performance, making comparisons among different scion sources very difficult. Vegetatively propagated clonal rootstocks which would alleviate this problem are currently being sought for several ornamental tree species in research work at East Malling.

Evaluation. The initial evaluation of subjects is carried out in replicated trials planted at East Malling or at one of a number of collaborating centres. The plants are regularly assessed by staff at the trial centres and also by panels consisting of nurserymen, botanists, plantmen, and consumers.

One of the first and most important facets of evaluation concerns trueness-to-type, i.e. whether the plant is correctly named. This is also one of the more difficult areas as horticulturists, nurserymen, and scientists occasionally differ in their interpretation of correct nomenclature and plant naming. Wherever possible the rules set out in the International Code of Nomenclature for Cultivated Plants (3) are followed; additionally, attempts are made to aid identification by obtaining propagules of the original named plant or an original published description. Colour photographs are taken and pressed herbarium specimens prepared of the selected plants and some of the more interesting variants. Sometimes the International Registration Authority for a particular subject is able to provide information that clarifies identification, but unfortunately, many of the plants currently being assessed are not covered.

Plants identified as being true-to-type are then further assessed on the basis of propagation, establishment, vigour, habit, and aesthetic qualities. The last category obviously varies with the subject studied but usually involves comparisons of leaf, stem or flower colour and abundance.

Distribution. After selection of the best plant from within a trial this plant is used as a nucleus from which stock is propagated at East Malling for eventual return to the contributing centre (or a nominated alternative) for subsequent commercial release.

A list of the plants selected and released to date, together with the primary distributing centres is shown in Table 1 whilst those plants selected in 1985 and currently being built up from a single plant are shown in Table 2.

Table 1. Plants selected and released to date and the primary distribution centers.

Selected Plants	Distribution Centres
<i>Buddleia davidii</i> 'Empire Blue' EM84	Waterers Nurseries, London Road, Bagshot, Surrey
<i>Buddleia davidii</i> 'Royal Red' EM84	Darby Nursery Stock Ltd, Methwold Hythe, Thetford, Norfolk
<i>Cornus alba</i> 'Spaethii' LA79	Darby Nursery Stock Ltd.
<i>Cotinus coggygria</i> 'Royal Purple' EM84	Darby Nursery Stock Ltd.
<i>Cotoneaster conspicuus</i> var. <i>decorus</i> EM84	E.R. Johnson Ltd., The Nurseries, Whixley, Norfolk
<i>Forsythia</i> × <i>intermedia</i> 'Lynwood' LA79	Wyevale Nurseries Ltd., Kings Acre Road, Hereford
<i>Lonicera periclymenum</i> var. <i>serotina</i> EM84	Wellington Nurseries, Brandon Cres. Shadwell, Leeds
<i>Philadelphus</i> × <i>virginialis</i> 'Virginal' LA82	Waterers Nurseries
<i>Potentilla fruticosa</i> 'Tangerine' LA79	James Coles & Sons, Thurnby, Leicestershire
<i>Sambucus nigra</i> 'Aurea' LA80	Scott's Nurseries Ltd., Merriott, Crewkerne, Somerset
<i>Weigela florida</i> 'Variegata' LA83	Pershore College of Horticulture, Pershore, Worcestershire

Table 2. Plants selected in 1985 and currently being built up from a single plant.

<i>Euonymus fortunei</i> 'Silver Queen' EM85
<i>Euonymus fortunei</i> 'Gracilis' [<i>E. fortunei</i> 'Variegata'] EM85
<i>Crataegus crus-galli</i> EM85
<i>Crataegus laevigata</i> 'Coccinea Flore Pleno' [<i>C. oxycantha</i> 'Paul's Scarlet'] 1985
<i>Crataegus laevigata</i> 'Punicea Flore Pleno' [<i>C. oxycantha</i> 'Rosea Flore-Pleno'] EM85
<i>Betula pendula</i> 'Dalecarlica' EM85
<i>Cytisus</i> 'Burkwoodii' EM85

Publicity. Now that a significant number of subjects have been selected and are available in quantity from distributing centres, it is intended to publicise the scheme more widely in the trade press. It is hoped that this will generate increased interest in the C.S.S. and stimulate demand for selected plants.

Mature specimens of all of the selected plants will be available for inspection at East Malling whilst selected tree and shrub subjects will be held at Luddington and Efford EHS's, respectively. Demonstration plots containing some of the C.S.S. selections are planted at the Northern Horticultural Society's Harlow Car Garden in Harrogate and similar demonstration areas are planned.

STAGE II

A recent change to the C.S.S. is the proposed introduction of a second phase of the selection process (Figure 2). The best clones, including the selected clone from each trial, will be repropagated for assessment of additional factors of interest to the ultimate consumer. Where appropriate, it is hoped to assess factors such as:

Virus status	Speed of establishment and
Herbicide tolerance	ground cover
Winter injury	Genetic stability
	Mature characteristics

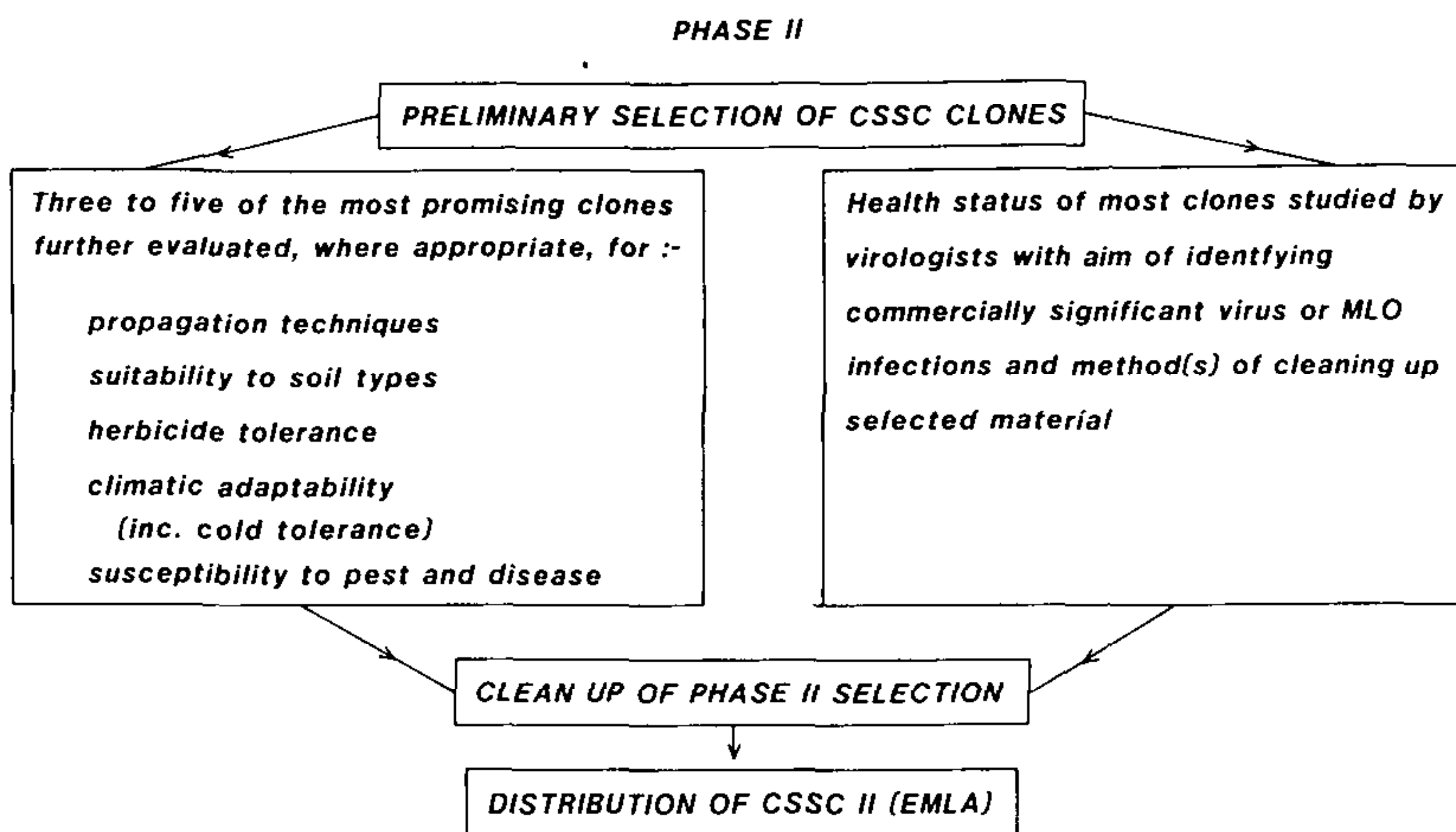


Figure 2. Proposed introduction of a second phase of the selection process.

Freedom from virus. Preliminary testing has already started to determine the virus status of a number of the selected and other superior clones of plants within the C.S.S. using the Double Stranded RNA and other techniques. Unfortunately in most cases little is known of the nature of viruses or microplasmas infecting hardy ornamentals and even less of their effect upon growth and performance. Removal of viruses, using heat therapy or other techniques may not always improve plant quality and much more needs to be known of the influence of these organisms on plant growth and performance

before techniques for obtaining and maintaining freedom from infection can be developed and recommended.

Work at the University of Bath suggests that the selected clones of *Buddleia davidii* 'Empire Blue', *Buddleia davidii* 'Royal Red' and *Lonicera periclymenum* 'Serotina' are free of debilitating viruses.

One investigation currently in progress aims to discover any connection between virus infection and poor propagation (e.g. *Acer platanoides* 'Crimson King').

Many virus-tested cultivars of two species (40 ornamental *Malus* and 20 ornamental *Prunus*) are currently available through the EMLA scheme. However, much of this virus-tested material may be lost under the proposed reorganisation of the EMLA scheme.

Suitability of selected plants for micropropagation. Experiments on fruit species and cultivars have shown that micropropagation may induce juvenility in some plants resulting in increased growth and easier propagation but delayed flowering. Selected plants from the C.S.S. will be micropropagated and their subsequent performances monitored in comparison with conventionally raised material. Selected plants will also be used where appropriate for other micropropagation research such as the genetic manipulation of woody ornamentals to produce new variants and the development of new micropropagation techniques.

CONCLUSIONS

The aim of the Clonal Selection Scheme has remained consistent since its initiation in 1975, that is "to upgrade the general quality of British hardy ornamental nursery stock and eliminate inferior and wrongly named plants". It is hoped that some of the changes outlined in this paper will facilitate the achievement of this objective.

Financed by the Ministry of Agriculture, Fisheries, and Food through their Agricultural and Food Research Council, the Clonal Selection Scheme will continue to depend on the goodwill of nurserymen and others to donate material, serve on committees and selection panels, and provide land for evaluation trials. It is hoped that many members of the industry will continue to give their active support to this scheme.

LITERATURE CITED

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ANATOMICAL STATUS AND ROOTING OF *EUONYMUS JAPONICA* L. CUTTINGS

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The vegetative propagation of the evergreen shrub, *Euonymus japonica* Thunb., plays an important role in the production of decorative material. In Bulgaria this species is grown mainly along the Black Sea coast but it may also be grown in other regions of the country where there is a warmer climate. We are looking for other ways for successful propagation of the subject through rooting cuttings. These are usually taken from one-year-old shoots.

The main task of our study is to analyse the anatomical structure of the current (one-year-old) shoot of *E. japonica* since it has a definite importance for the emergence and forming of the root system of the cuttings with respect to rooting during different times of the year.

MATERIALS AND METHODS

Initial mother plants were 5 and 15-year-old groups of shrubs. The one year old shoots collected from them for anatomical analysis were fixed in FUS. The cuts were performed on Reichert's microtom. The colouring of the preparations is carried out with hematoxilin-eosin. The anatomical observations conducted with the aid of a light microscope on three cuts of the shoots — base, middle, and below the top bud.

Softwood cuttings were cut the middle of each month from a shoot with a length of 8 to 10 cm (three to four nodes) and reducing the leaf mass by about 70%. the cuttings were rooted in cold frames and heated greenhouses in a mixture of washed river sand and perlite in the proportions of 2:1.

RESULTS AND DISCUSSION

During the growing period *E. japonica* forms three flushes of growth. The first is from the middle of March (the bursting of buds) until the second half of May. The second one is from late May until the middle of July; the third one is from the beginning of August until the end of the growing period. The first and the second growth are almost equal but the third is