SEEDLING PRODUCTION—A CURRENT PERSPECTIVE

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INTRODUCTION

Seedling production in the hardy ornamental stock industry in the U.K. has made dramatic steps forward in the last 15 years or so; previously it had been almost the exclusive prerogative of the European Continental nurseryman.

Seedling production, as a component of hardy ornamental plant production, however, is still a relatively minor sector. The vast majority of such plants, both in numbers and value, is still being produced by vegetative means. Nevertheless, the propagation of plants from seed in the U.K. has very rapidly developed a sophistication in terms of logistics, science, and economics which is comparable with the best conventional operations of vegetative propagation.

The production of seedlings falls into a series of categories, classified by the end product—none of these are mutually exclusive—but can be designated largely on the sophistication of production technique; for example: hedging plants, urban/amenity forestry, rootstocks, landscape uses, and specimen subjects.

The financial ''intensity'' of production is determined by the value of the product and the scale of production. The business is to produce a crop of seedlings of a sufficient quality on a profitable basis and this requires attention to a series of factors.

In an ideal world we would be able to understand each subject sufficiently to ''blueprint'' seedling production on the basis of:

(i) date of required seed germination
(ii) period or type of treatment to encourage germination of ''unencumbered'' seed
(iii) treatment of seed to remove dormancy constraints
(iv) storage conditions
(v) collection and subsequent treatment
(vi) source plant

It is not difficult to determine accurately for a fully imbibed and ''unencumbered'' seed, the period required for germination to occur under specified environmental conditions. Most seeds, however, are ''encumbered'' and require some form of treatment to release them from these constraints.

It may simply be a question of treating the seedcoat to allow imbibition but such techniques are still primitive and coarsely managed. No significant advances have been made in the treatment of such seeds since scarification and acid digestion were recommended.

Seeds may then require a period of chilling but what is known of threshold temperatures and periods of exposure? Even the physiology is not well understood. Despite literally thousands of papers on this subject, virtually no practically useful recommendations can be extracted and despite the tremendous advances in cellular and molecular biology, as well as concurrent promises that it is only a matter of time—that's what it is!

To a lesser degree, but still significantly, some subjects exhibit ''immature'' embryo conditions.

SEED SOURCES

Vast improvement in the collection, extraction, storage, and distribution of commercial seeds has been experienced in recent years and suppliers nowadays are becoming more concerned, for the consumer standards have risen world-wide in :

Identification (reliability/provenance/selection),
Reliability of supply—or communication of crop failures,
Maintenance of viability/storage, and
Season of delivery.

This is not to suggest that the present situation is in any way approaching perfection but it does recognise that the interests of the consumer are being recognised by the supplier.

SEED COLLECTION

The local collection of seed by the propagator is still a major contributor to production and, provided that it is economically managed and costed effectively, then its place is assured. Local collection allows for sure identification, parental selection, optimal season of collection, rapid processing and storage, and hence reliability of supply.

SEED STORAGE AND VIABILITY

The successful storage of seeds depends on maintaining the highest levels of viability for the required storage period. This requires knowledge of suitable storage conditions for the duration envisaged and must be related to the condition, composition and physiology of each individual subject: generalisations are suspect and rarely provide a satisfactory answer.

However, the greatest signficant feature contributing to successful storage is to commence the storage treatment as soon after collection as is feasible, so that the attenuation of viability begins at the highest level and with the greatest potential (i.e. before any significant deterioration in viability has occurred) thus giving the longest period of storage life.

CHILLING AS A DORMANCY BREAKING TECHNIQUE

The need for the cold stratification of seeds of plants of temperate region origins has long been a subject for discussion and the fact that such seeds require to be exposed to 'cold' in an imbibed condition has been well known.

The physiological encumbrance which prevents seed germination can only be eliminated once a critical pathway in the seed's metabolism is available and this requires a knowledge of the threshold temperature at which this becomes available. No one temperature is critical, each subject has its own and there is evidence to suggest that some subtropical plants require a "chill" (at about 15 °C). Chilling is, therefore, a relative phenomenon and this response criterion usually reflects the particular climate experienced naturally by a particular subject.

Once a suitable threshold temperature has been established, the length (time) of chill is relatively constant with little variation within a taxon (unless climatic provenances are existing). Reported variations among samples can usually be attributed to incomplete imbibition, restriction of oxygen permeability, other seedcoat conditions, etc.

Temperatures below the threshold do not accelerate the process but similarly do not hinder unless sufficiently low to cause freezing of intracellular water, thus it is possible to select chilling temperatures to suit a collection of subjects (all responding below a particular threshold temperature).

SUMMARY

Seedling production, despite considerable practical advances in recent years still remains a system largely based on empirical and traditional approaches. The vast array of scientific literature on seed physiology has yielded little of practical significance to the propagator and the major breakthrough is still awaited.