

foliage Seedling progeny appear identical to the parent, at least as to foliage and growth habit

Yuccas — Here is one item that has been unreliable from the seed houses. When ordering *Yucca filamentosa* we have obtained Lord knows what. The logical and easy solution is to gather your own seed

Little-leaf linden [*Tilia cordata*] — seedlings grown from imported seed appear to be entirely satisfactory as an understock. However, they are not satisfactory to grow on. They want to make a bush rather than a tree and no amount of pruning and staking seems to bring them around to an arborescent form I suspect the seed is gathered from bushy forms where it can be readily collected.

On the other hand, seedlings produced from *Tilia cordata* parents growing in this country grow into respectable trees Other than for understock, I believe it would be highly desirable to collect seed from 'Greenspire' or similar superior clones One cannot reproduce a clone by seedage, but the resulting tree should be better than the typical species.

MODERATOR SHUGERT: Excellent paper, Hugh; and we are indebted to you! Our fifth speaker, Hans Hess, is well known to all of us. This gentleman is an outstanding grower and shall share with us his experiences on the seeding of difficult species.

SEEDLING PROPAGATION OF DIFFICULT SPECIES

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This topic is somewhat evasive in that we have no definition of what is a "difficult" species; what is difficult for one person may be very simple for another. I believe that it all terminates with enough experience to arrive at a successful conclusion — in this case a good stand of healthy seedlings. As an example, one of our members inquired some months back about the proper handling of *Myrica pensylvanica* seed. He explained that he had purchased seed, planted it the same fall he received it and had no success; this happened for several years. I inquired as to his handling of the seed and he explained that it was planted immediately upon receipt from the supplier. This will not do when planting bayberry seed. Bayberry seed has a waxy gray coating which is used in the manufacture of bayberry candles. This waxy covering must be removed prior to planting in order to obtain germination the spring after planting.

Some very popular species at present are the amelanchiers — known as June berry, shadblow, sarvis tree and other common names. These plants flower early in the spring and the fruit ripens, depending on the area, sometime during June. It must be

picked as soon as it ripens, or even just prior to being fully ripe, the birds will get it before you do. It should be cleaned immediately, using either a commercial seed cleaner, or by rubbing the fruit through a screen, floating out the pulp. After it is cleaned by either method, plant it, or mix it with slightly moist peat and store until you are ready for planting. Do not let the seeds dry or there will be no germination, since they are very sensitive to drying.

Another species that needs to be handled almost in the same manner are the magnolias. Seed of *Magnolia kobus* purchased from Japan provides no seedlings whatsoever; seed picked locally and planted promptly or stratified until ready for seeding gives excellent germination.

Many people consider Japanese maple cultivars difficult to grow from seed; actually they should present no more problems than Norway maple. We have found that seed purchased from many suppliers does not give good consistent results for various reasons. One of the major problems is that there are two types of Japanese maple seed, a large-fruited and a small-fruited type. The small-fruited type, if received before the end of the year and planted promptly, will usually give a fair percentage of germination. The large-seeded type received and planted at the same time gives no germination. If the bed is kept properly mulched and weeded there is a fair chance of a reasonable percentage of germination the second year, very expensive at best. We have found that the best results for both large and small-seeded cultivars is obtained by collecting and planting the seeds during September for the New Jersey area; areas north or south would vary slightly. The seed must not be allowed to dry out or germination percentage will fall tremendously.

Viburnum cultivars have frustrated many people and yet there should be no serious problem with them. Seeds of most of the *viburnums* will germinate, or at least partially germinate, (root emerges) the fall after the seed ripens. These can be handled in two ways—you can either clean and plant the seeds the fall they ripen, maintaining a mulch and weed control through the summer, or you can stratify the seed after cleaning and plant the following fall. A word of caution, if you use the latter method, the seeds germinate (the radicle develops) depending upon the cultivar, anytime from July to November, so keep a close watch on the stratified seed to be sure it does not sprout before you get it planted.

Many people have had a problem with *Fagus sylvatica* and *Fagus americana*; here again the seed must not dry out. Usually seed of *Fagus* cultivars does not arrive from the supplier until sometime in late December or early January when the ground is

frozen. Seedbeds are not at their best at this time; in fact, they may even be snow-covered. We have found that seeding *Fagus* as soon as the seeds are received, whether or not the ground is frozen, gives the best results. Have the beds prepared in the fall. If they are snow-covered, plow the snow off and plant; you will be pleasantly surprised by the results. Someone is sure to recommend stratifying the seed when you receive it and plant in the spring. This would be a very good approach except that *Fagus* seed partially germinates just as the frost begins to leave the soil and would be sprouted before you were able to plant if it was stratified.

Cornus mas, the Cornelian cherry, has never been easy from seed and very few growers, including ourselves, can produce a consistent crop of seedlings. The best method we have found is to keep the seed in stratification for 2 years before planting because of the dormant embryo. The few seedlings germinating the second year are forgotten. We also found that *Ilex opaca* is similar to *Cornus mas* and gives a small percentage of germination after 1 year, but gives a high percentage if kept in stratification for 2 years prior to planting. The dormant embryo and extremely hard seed combine to delay germination for 2 to 3 years. You can determine the potential germination percentage of *Ilex* seed in stratification by checking the ease with which you can cut the seed with your thumbnail. If you can easily cut the seed in half by pressing it against your index finger with your thumbnail the seed is ready for germination.

Some other species for which seed propagation is not difficult but which should be handled like the viburnums are: *Chionanthus virginicus*, *Syringa amurensis*. var. *japonica*, and *Clematis paniculata*. The seeds all germinate in late summer or early fall and should be planted immediately, mulched and maintained until germination the following fall.

In summary, for good success with any kind of seed, you must have good, fresh, viable seed. They must be properly cleaned and handled according to the requirements of the various species. Pick your own seed whenever possible if there are problems in getting good viable seed from a regular supplier. Clean, plant, or stratify the seed as quickly as possible after picking. Remember that the closer you can come to reproducing the situation provided by Mother Nature the more successful you will be.

MODERATOR SHUGERT: We shall now acknowledge questions from the floor.

CHARLIE PARKERSON: Al Fordham, how do you get the wax off of bayberries?

AL FORDHAM: We use only small lots and it can be done with hot water or by rubbing them through a screen.

HANS HESS: To elaborate on that point, a commercial seed cleaner will clean them very easily.

MODERATOR SHUGERT: For a small lot you might also use a Waring blender.

JIM WELLS: Is anyone using hot water or sulfuric acid for seed treatment?

HUGH STEAVENSON: We are using sulfuric acid for seeds with a hard seedcoat, especially the legumes. We use commercial sulfuric acid as it comes from the carboy. The USDA Seed Manual, to which Ralph referred, gives time periods for many species; there is quite a wide latitude. The acid is strained off with a screen and the seeds are rinsed with lots of cold water. A little baking soda in water is added to the seed to counteract any residue of the acid.

MODERATOR SHUGERT: As a comment from the chair, I want to point out that the acid method is dangerous if it is not adequately controlled. Because of this, and the fact that we treat much smaller lots of seed than does Hugh, I prefer the hot water treatment. But, as has been mentioned many times, when using the hot water method, test a small lot at the temperature you intend to use before you treat the entire lot.

JIM WELLS: Is anyone using steam as a treatment for controlling seed-borne diseases? I saw this being used recently in Australia.¹

JOERGE LEISS: As Tom Pinney pointed out, I think it is sufficient to treat the seed with a fungicide.

DAVE DUGAN: I believe the process Jim is talking about is used for the control of virus, not fungal diseases. This should not be confused with the method Tom Pinney is using — which is for fungal diseases.

BRUCE BRIGGS: I would like to hear some comments as to whether a medium is necessary when stratifying seeds. Some of the large growers on the West Coast are treating the seeds with hot water and then placing them in poly bags without any medium.

MODERATOR SHUGERT: Appended to Bruce's question I would like to ask whether it is necessary to have wet seed rather than dry seed to go into stratification?

HAROLD PELLETT: There is a definite benefit to having fully imbibed seeds before placing them in stratification since the

¹ Ed. Note — See paper by A. Newport, page 441

dry seeds do not perceive the cold stimulus very well. With fully imbibed seed the treatment will be more uniform and will usually take a slightly less time. There is an advantage to having a medium mixed with the seed when they go into stratification in that the medium serves as a moisture reservoir to insure the seed against drying out. The amount of seed being stratified and the method of sowing after stratification is completed would probably determine whether a medium should be used or not.

AL FORDHAM: I feel that a moist medium is necessary. We did some work with *Chaenomeles* seed stored with and without medium and those stored without medium gave us no germination at all. We keep the volume of medium small and sow seed and medium together.

MODERATOR SHUGERT: I would comment at this point that if you are sowing the seed broadcast it need not be separated from the medium, but if you are drilling the seed with a planting machine, you must separate the medium from the seed or the medium will clog the equipment.

CHARLIE PARKERSON: Tom Pinney talked a lot about cost accounting and I would like to ask him what he does when he finds that a crop is not making money for him. Do you change the procedure, make a price list adjustment, or discontinue the crop?

TOM PINNEY: When we got our cost accounting system operating, we found that there were some items that had to be jumped 100% in price. My father and I agreed to do this over a 3 yr period; we are still in business and cost has not caused us to drop any item from our plant list; however some have been dropped for other reasons.

MODERATOR SHUGERT: We are out of time; it has been an excellent symposium and the audience has participated very well. I thank our speakers for a job well done.

(EDITORS NOTE: Mr. David Paterson was moderator for the second half of the Wednesday afternoon program).

MODERATOR PATERSON: A program on plant propagation would not be complete without some information being given about the use of growth regulators in plant propagation. At this time I would like to introduce Paul Read who will talk about slow-release growth regulators for rooting cuttings.