One Way to Start Seedlings

by Philip Seitner

Introduction. The following routine for controlled magnolia seed germination and windowsill seedling care is not claimed to be ideal for everyone. I have used it successfully in the absence of any greenhouse facility, coupled with circumstances which have made it impossible to adequately monitor an outdoor seed bed. Following it in 1979, I lost only two or three seedlings of over 100 in over 25 pots held for five months before transfer to outdoor beds. It is an adaption of a procedure resorted to for Primula seedlings, devised after annually wasting time, labor, and seeds (not to speak of money) following patterns recommended by experienced Primula growers, patterns no doubt successful under different conditions.

The procedure is simple, belying the length and detail of its description. (A full written description of neck-tie-knotting or shoe-lacing, both simple procedures, might prove equally tedious to follow.)

A basic assumption here is possession of windows affording some sun (east, west, or south, in Chicago; presumably east, west, or north in Melbourne). Some form of artificial lighting should not be impossible, but hasn't been tried by this writer.

Success is more assured - regardless of the procedure - by holding constantly in mind some elementary factors: water, light, heat, oxygen, CO_2 levels (during germination), and fungi; the first four to be controlled, the last to be avoided. One more might be added: the planting medium character, it should permit easy root penetration and epicotyl emergence and should assure moisture retention, yet permit drainage and root aeration. None of these apply exclusively to Magnolia seed handling, but none can be excluded from it.

Pre-germination Storage; Cold Treatment

Autumn planting of Magnolia seeds in outside beds, cold frames, or in soil in pots can admittedly be successful and, when it so proves, is generally forthwith claimed to be the easiest and most practical method. Nevertheless, it can only be guessed the numbers of viable seeds, Magnolia included, that are lost through outdoor planting, for it is fraught with risks for the less experienced person.

Outside planting does assure one factor important to Magnolia seed germination: a conditioning exposure to low temperatures which temperate Magnolia species seeds appear to require and, in any case, do require for controlled, even germination in a seed lot. However, no study has demonstrated that Magnolia seed germination is improved by the alternation of temperatures which outside planting would provide; a constant low temperature proves adequate. Further, freezing is not only not required but probably should be avoided, in the absence of studies demonstrating its innocuousness. Thus, this requirement for cold exposure is easily if not better provided indoors by the home refrigerator, but not in the freezing compartment.

The Magnolia embryo is sent forth into the world enclosed in three protective coats. An outer cushioning red or orange coat covers a middle, bone-hard, brown or black encasement; an inner, tough, membranous coat ensheathes the embryo. To prepare for cold treatment, the fleshy outer seed coat should be removed, if still present, by soaking it in cold water until soft (one or more hours, depending on its state of desiccation.) The coat has a high oil content and its decomposition, especially during indoor handling, invites mold growth and seedling loss.

Cold treatment should be initiated at least six to ten weeks before a practical germination date which optimally would be April through May to take full advantage of long-day summer light. During cold treatment, moisture must be available as well as oxygen because, as the embryo gradually stirs from dormancy, it has increased demands for both water and oxygen.

The best storage medium for cold treatment is coarse, unmilled sphagnum moss. It should be moist but loose (namely, not water-saturated), held in an unsealed plastic bag to minimize water loss yet permit gas exchange (½- to 1 inch gap at the bag closure), and the seeds should be limited in number and well distributed through the moss. For each species or hybrid a separate bag should be prepared, each labeled indelibly.

Before using sphagum moss, it has been part of my routine to boil it, cooling it immediately thereafter with cold water from

the tap (using a sieve), followed by squeezing out as much water as fist pressure permits. This cannot pretend to represent sterilization, but it has seemed (without real experimental evidence) to reduce later seedling loss. It also brings the moss to the optimal, barely moist, spongy condition for inserting into the bag and for receiving and uniformly suspending the seeds. Occasional attention over the following refrigeration period is recommended, checking moisture and sprinkling in a small amount of water if replacement seems necessary.

After the 6 to 10 weeks of refrigeration, the bag should be removed, placed in a cool, shaded spot, and monitored. The first visible evidence of germination should occur within 1 or 2 weeks, the hard seed coat being forced open at the tapered end from internal pressure of water inbibition, its two halves separating like the valves of a clam. The root tip will emerge a day or so later. Occasionally, especially if refrigeration has been exceptionally long, germination will begin during refrigeration, accelerating immediately on release from cold. Therefore, it is wise to examine the seeds at least casually on removal from the refrigerator. In the reverse, an occasional seed, even after cold treatment, proves to be a laggard, for unknown reasons. Since laggard and dead seeds are most often indistinguishable, it has proved advisable to postpone for several weeks the discard of unsprouted seeds. After about 5 weeks, watching for further germination reflects more fantasy than hope and the seeds can be dispatched.

It is worth noting here how tempting it may be to take a germinating seed to a garden spot, "plant" it, and let nature take its course, thus avoiding the burden of further inside care. This short cut has been tried. It may succeed. But nature's course is a fickle one and if the seeds are at all precious (and, at this stage, some precious time has already been invested in their pre-germination treatment), it might be advisable to proceed to the next step with at least a portion of the seeds.

Seed Potting

Seeds could conceivably be potted before refrigeration, eliminating bagging for the cold treatment and avoiding transfer to pots after treatment. However, performing both bagging and potting steps provides advantages. Bagging gernerally requires less refrigerator space than pots would occupy. Further, since germination is seldom 100 per cent and, in some seed lots considerably lower, bagging permits selection for potting ONLY seeds proven viable. Potting care can greatly increase seedling survival chances. Further, while seedlings are in pots, they can readily be shifted to their advantage as well as to the grower's; they have even been taken along to be cared for on a vacation trip.

Transfer to pots is easiest at the stage of root tip emergence. A 4- or 5-inch-diameter pot, 4 to 5 inches deep, is adequate for starting three to five seedlings. Smaller, shallower pots are not practical for even a single seedling.

Soil is never used in the pots. Coarse sphagnum, pre-boiled, squeezed, and well-packed into the pots, is the sole support needed for seedlings until planting out, even if that should be two or three months later. Not being particulate (like vermiculite, for example), it will not wash out or spill; unlike many soils, it never cakes nor holds excess water; it allows free root penetration and aeration; all of these qualities tend to reduce risk of seedling fungal infection.

Advantage should be taken of the full depth of the pot. After the seeds are planted, the sphagnum surface should be no less than ½ inch below the pot rim and the seeds should be not much more or less than ½ inch below the sphagnum surface. Every precaution should be taken to avoid any seed becoming dry during the transfer. After the seeds are covered, the pot should be watered gently until water flows from the drain and then set in a cool shaded place. A sheet of thin plastic can be stretched across the top to avoid accidental drying. After a week, the pots should be examined frequently. When emergence begins, the pots should be shifted to the light and the plastic cover removed.

Occasionally, a seedling will emerge and straighten, carrying with it the inner membranous seed coat or even the hard middle coat. The membranous coat dries and hardens, often impeding cotyledon expansion and even resulting in death of the seedling if sun should strike it and overheat the entrapped cotyledons and epicotyl. With a little time and patience, the membrane can be removed by repeatedly dripping water over the seedling or placing a plastic cover over the pot to hold humidity until the membrane is thoroughly softened and pliable. With gentle use of forceps or other suitable instrument, and care not to bend and snap off the brittle stem, the membrane can be slipped or peeled off, releasing the cotyledons.

After emergence, the seedlings need watering only. An occasional modest feeding with soluble plant food is probably advisable if transfer to an outside bed is postponed for several weeks. The pots should always drain thoroughly after watering for which reason they should never stand in saucers which retain water. They should be turned as necessary for even stem elongation. Especially in hot weather, care should be taken to avoid air stagnation and overheating of the pots (and roots) when exposed to sun.

Transplanting

The first year I used this procedure the seedlings were transplanted to outside beds early in the summer (probably in June), the objective having been solely to get the seedlings started and strong enough to assure outdoor survival. In subsequent years, transplanting has been postponed for one or another reason and in 1979 transfer to the outside bed was not possible until September and October. The advantages and disadvantages for early or late transplanting must be judged as circumstances dictate. As far as the seedlings are concerned, the results of early or late transplanting from pot to garden soil seem equally satisfactory.

After selection and preparation of the seedling bed, a hole should be dug as deep as the longest seedling root, which may be 8 or 10 inches or more. The seedling, carefully freed of the sphagnum in which it has been growing, should be placed in the excavation with the root tip falling approximately at the point where the seedling position is preferred and soil finely sifted over the root to a depth of 2 to 3 inches; the plant should then be gently lifted so as to leave the lower 2 to 3 inches of the root in the soil. The process is repeated, each time lifting the plant top but not the covered root. Eventually, the excavation will be filled, with the root extending its full length vertically through the soil. Only then should the soil be watered and settled around the root, holding the top of the seedling to prevent its sinking with the settling soil. More soil can be added to the top to compensate for any settling, until the top and rim are level and the seedling is securely upright in the soil. Special care should be taken to avoid any drying of the seedling's roots during planting. With a little care, there need be no loss nor even any growth retardation from this transfer.

In colder zones, seedlings of species with marginal capability for cold survival (*M. macrophylla*, for example) should be given some protection the first winter or two. Mulching that may waterlog and smother or weigh down and break seedlings should be avoided. Evergreen twigs or branches arranged carefully around and over a seedling and supporting a 1- to 2-inch straw or leaf layer serves adequately, placed on after early frosts have brought full dormancy, and removed in late March.

Some Magnolia species seedlings, for instance, those of *M. acuminata*, often grow rapidly and can be transplanted to a permanent position in two or three years. Others may require several years of care before they reach practical transplanting size.

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If you can make it out through the dapples, that's Magnolia kobus *there, on the bottom, and* M. campbellii *spilling over from the top. Brian Savage saw this one during his tour of Killerton, Devonshire, last year, and reports that the tree dates from about 1912 and was supplied by the Veitch nursery concern. He says there are a number of others in the West Country of England all apparently from the same grafting since they all show the same effect.*