"Nursery Propagation by Hardwood Cuttings" Question-Answer Period

No recording.

Seed Collection and Cleaning Revisited

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The seed is sown. Adequate water is imbibed. Temperature is modulated. Soil- and water-born pathogens are controlled. Appropriate lighting is applied. Germination can then be expected to occur. These conditions assume one crucial element; the propagator has acquired and sown viable seed with adequate vigor. Increased mechanization, cost-consciousness, and competition in the nursery require the propagator to obtain quality viable seed. Seed must be, true to type, and free from waste, pathogens, and contaminates. As a seedsman, who has been involved in the collection and distribution of ornamental tree, shrub and palm seeds for over 23 years, I have acquired some practical expertise. The skill for this trade is learned through practice, education, apprenticeship, and trial and error. From where and how the seed travels from plant to propagator is the subject for discussion.

Collection Sources for seed stock are varied and numerous. Seed orchards are reliable yet costly. Field or container nurseries provide a uniform collection site. Regionally required seeds may be located in native fields, parks, schools, commercial centers, street plantings, and private residences. Best time to scout site location is prior to need. Many parent plants are easily spotted in their conspicuous bloom (*Chorisia, Fremontodendron, Grevillea*). Record locations on maps and file cards. A hand tape recorder is effective while traveling.

Ultimate growing habitat is important in site selection. Not a great problem in the woody ornamental trade, elevation and habitat are crucial for native restoration plantings. Seedlings introduced into locations foreign to their parental climate may lack adequate vigor and form (*Liquidambar styraciflua*). Collection sites should be monitored so cross-pollinating species have adequate isolation (*Agapanthus, Asparagus, Eucalyptus, Prunus*).

Timing of the seed collection is a crucial element. Maturation of the seed is the single most elemental component for quality seeds. Maturation can be stated as the point where the seed has reached its maximum fresh weight. Maturity provides the seed with adequate carbohydrate reserves, stored proteins and fats, and adequate nutrients translocated from the parent plant tissues (Bewley and Black, 1978). Additional hormonal changes provide proper germination triggers.

Determining maturity requires familiarity with the plant. Fruit color, texture, and physical condition are clues to adequate maturation. Avoid immature fruit or "green seed". A cut test is essential. Cutting longitudinal exposes the endosperm and

embryo. Fully developed embryos or embryos surrounded by an endosperm of uniform creamy color are desired. The endosperm should be smooth, uniform in color and texture, and not excrete when pressed upon—"hard dough stage" (Young et al., 1986). Avoid hollow, discolored, deformed, and insect-ridden seeds and fruit. Make several tests to validate a collection decision. A horizontal cut of cones or pods gives an estimate of seed count, an important economic consideration (*Cedrus, Hypericum, Liriodendron*).

Access to public and private sites is obtained prior to collection. Public grounds require some lead time as the authorizing agent or representative may be difficult to locate. Permission is likely to be granted when applied for with prerequisite liability insurance and a release from indemnity form. Public agencies require up to 1 million dollars of coverage. Conditions of collection are; the plant is not to be harmed or its natural beauty impaired, all debris be removed and disposed, and the site be left clean.

Private sites have lessor quantities of seeds yet often of a higher quality. In approaching private sources, the unique opportunity of trade liaison presents itself. I am frequently asked questions concerning common horticultural problems. Time with the owner is an opportunity to extol the benefits and virtues of landscaping. For rare, valuable, or prolific seed stands, it may be appropriate to offer a gratuity for access. This act may lead to annual collection privileges.

Harvesting equipment is basic with few changes over the years. Essential equipment includes ladders, telescoping poles, pruners, cone hooks, mauls, hand shears, and various mesh screens. Netting, shade cloth, tarps of canvas or 6 mil polyethylene, trays, barrels, burlap, and poly-woven sacks are used to capture and transport the seed pods and fruit. Requirements to engage in safe and sound principles of harvest and collection are necessary. Essential safety equipment includes climbing harness and ropes, street cones, signage, particle and dust masks, protective eyewear and safety hats and shoes. Harvest of the crop is simple in concept, yet made more difficult in practice. Simply put: "get the seeds from the plant to the sack for transport and cleaning", does not do the task justice.

Techniques for collection and cleaning vary according to three recognized fruit types(Pollock and Roos, 1972).

Dry Fruits **(I).** Comprising the majority of seed formations, dry fruits are collected prior to dispersal. The seed-bearing structure or fruit is removed whole from the plant when slightly immature. Fruit, branchlets, or complete branches are cut. Pruning ethics are required to maintain the parent and insure future growth and cropping. The plant material spread in shallow layers upon tarps, afterripens as it drys to maturity. Frequent pitching and rotation of the drying crop is required to foster uniform ripening and discourage mold and fungi development from inadequate air circulation. Threshing or beating the crop releases fully mature seeds from the parent. Outdoors, the crop should be covered at night if dew or moisture is anticipated. Insects, animals, or birds may be devastating to your unprotected crop (cones: *Cedrus, Pinus*; pods: *Brachychiton, Eucalyptus, Grevillea, Jacaranda, Lyonothamnus, Wisteria*; umbels: *Agapanthus, Cyperus*; follicles: *Agonis Liquidambar, Magnolia.*)

Non-Dehiscent Fruit **(II).** Covered with an adhering fruit or outgrowth these are the second group. Mass collections require fruit to be fully mature. Fruit is hand

picked, failed with tall poles, or shaken loose to fall upon tarps. Ripe seeds readily dispersed by wind make collection feasible only during calm dry weather. Wet or foggy conditions allow the seeds to remain attached to the parent requiring excessive shaking or failing to release the crop (samaras: *Acer*, *Fraxinus, Liriodendron*; nuts: *Pistacia, Quercus*.)

***Fleshy Fruits* (III).** Surrounded by fleshy pulp or skin, the fleshy fruits are easily identifiable. Collection is made by hand picking, knocking, or shaking ripe fruit upon tarps. Parents may bear differing degrees of ripened fruit. Only those that fall freely are harvested. "Green fruit" is left for follow-up collections. Twigs, insects, and leaf debris are promptly removed from the collected crop. Limiting fermentation and composting heat is important. Fruit is transported in breathable burlap sacks allowing air circulation. Storage of fruit should be brief and cleaning initiated promptly.

The cleaning facility need not be extravagant. A large drying location, preferably with southern exposure, sufficiently large to avoid cross contamination between collections is desirable. A covered outdoor area is extremely helpful during times of inclement weather. Indoor shop facilities include a fanning area to air-blow collections for preliminary processing, a wash area for water-processed seeds, a machine cleaning area, and a finish cleaning section. Nursery hygienic practices are essential. Trays, barrels, screens, and implements need to be clean and sanitized regularly. A bleach (diluted with water) wash (1 : 9, v/v) is safe, economical, and effective.

***Dry Cleaning*.** Seed types I and II are predominately cleaned dry. Seed extraction releases dust and debris. Adequate ventilation and respiratory protection is essential. People with sensitive respiratory systems should avoid this process. The cumulative effects of these dusts are unknown. All persons should exercise caution. Reactions from irritants found in *Agapanthus*, *Brachychiton, Cortaderia, Fremontodendron, Platanus*, and *Wisteria* range from simple topical skin irritations to impaired respiratory function.

Following drying, the collection is threshed releasing seeds from the fruit. Hand threshing requires rubbing the fruit through wire screens, beating the seed capsules in trays, flailing with poles upon tarps, or pounding in sacks. Durable seeds may be machine processed in a hammermill, although lawnmowers and yard vacuums can be effective. Attention to both motor speed and material flow is critical. Too fast an engine speed and seeds become chipped, too slow and the process is ineffective. Lower speeds and high volumes are most productive. Experience and patience are the key. Processing the seeds over several runs is effective to remove free seeds and eliminate problems of chipping or cutting. Machine threshed include; *Albizzia, Ceratonia siliqua* (carob), *Cercis*, and *Cistus*.

Threshed seeds and their debris are finished cleaned by fanning. The fan speed and height of material fall produce a graded separation. Heavy, sound seed and similar dense debris fall into the first tray. Dirt, leaves, and twigs are blown further into secondary trays. The final finish cleaning is hand sorting of sticks, rocks, and discolored or damaged seeds.

Air separator machines are commonly used in the seed trade to process threshed seeds. They produce a clean graded product requiring little finish work. Threshed material is passed over a scalping screen removing large debris and sticks. Seeds

and similar-sized material falls through sized screens where grading and sizing occur. Air flow blows away small particles, dirt, dust, and hollow or off-sized seeds. A uniform graded seed is discharged. Expertise is required in determining screen size and shape, agitation rate, and material flow. Effective operation requires adequate volume of material to process, hence it is not practical on small lots.

Wet Cleaning. Type III seeds are cleaned with water to free the encased seed from the surrounding fruit and pulp. This family must be cleaned promptly following collection as heat from decomposition and the proliferation of mold and bacteria in this warm moist environment can quickly spoil seeds.

After fanning, fruit is rubbed through wire screens or rubber booted in barrels. Maceration is monitored to avoid splitting or crushing fragile seeds (*Eugenia, Eriobotrya, Ginkgo, Laurus, Rhaphiolepis*).

Hard coated seeds: *Arbutus, Celtis, Cornus, Podocarpus gracilior* (syn. *Aftocarpus gracilior*), *Photinia*, and numerous palms may be machine cleaned in a Dybvig separator. Manufactured by Bouldin Lawson, my model uses a revolving plate to impel fruit within a metal barrel against a stationary vane. The bottom revolving plate is adjusted off the floor of the barrel to allow water and pulp to be flushed from the macerated mass. The larger cleaned seeds are left behind and discharged via a sliding door when the majority of the pulp is dispelled and the water flows clear. Care must be taken with this method. Seeds while exhibiting no external damage, may incur internal damage or bruising. These may expire in storage, show poor germination and vigor, or exhibit abnormal growth.

Floatation is the second step in wet cleaning. Sound, firm seeds are separated from pulped fruit. Heavy, sound seeds sink in water-filled barrels. Pulp and hollow seeds will float or settle above. With strong agitation, the debris can be poured or dipped off. The process is repeated until the water runs clear. Floatation can be enhanced through the use of surfactants (Wilber Ellis R-ll). Care in proper lifting techniques is vital. Clean seeds are poured off upon drying screens leaving behind dense rocks, sand and dirt. A final high-pressure wash is directed through the seeds to remove any trace residue and pulp.

Drying is the final step in the wet processed seeds with several notable exceptions. *Mahonia aquifolium* and *Nandina domestica* are simply drained of standing water and stored wet. Periodic flushing removes accumulated pathogens. To facilitate transport and storage, seeds are dried of surface and excess moisture. Sun drying is only to be used for surface drying. Dark colored seeds can overheat. Unable to give up moisture quickly, the seed coat shrinks and cracks causing the seed to split open (*Aralia, Eriobotrya, Eugenia, Laurus, Pistacia*). Surface moisture should be promptly dried from the white oaks (*Quercus species*) family and *Cordyline* to prevent germination from occurring under these warm moist conditions. Seed moisture content for storage should be sufficiently low to prevent germination, impair heat build up, retard fungi growth, and restrict insect growth and reproduction.

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