

have seen his results. But other professionals have not fared so well.

In a gallon can, this would be a good, salable item because huge flowers clothe the stem the first season. But like the species, a weak root has been inherited and while our mature plant losses are minimum, they might not be so for the commercial producer. While some fine plants are produced, seedlings are highly variable and losses are high from the many weaklings in every lot. So what does one do until a satisfactory root system is found for this fine cultivar? We continue to search for and to study various characteristics of other genera within the same family. And until we find a suitable understock, this beautiful flowering shrub may never be fully accepted.

MODERATOR DOBBINS: Thank you very much, Percy. We will move on now to our next speaker, Mr. Eugene Baciú, from Santa Barbara, California, who will speak to us on seed collecting. Gene.

METHODS OF SEED COLLECTING

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There are many ways to get started in the seed harvesting business. In 1952, I was gathering dry materials for the florist trade, and one day on the way to the disposal area a nurseryman stopped me and asked what I was doing with the load of *Streptolitzia nicolai podds*. He was informed that the color was not suitable for the florist trade and the pods had to be discarded. His reply was that the nursery growers "could surely use the seeds in those pods." So the pods were returned home, the seeds extracted, and a trip to Los Angeles was made. I received .02 cent each for the seed and a list of different shrub and tree seeds that were in demand. Now all that was necessary was to match the odd latin names to the trees, so you can imagine what a time one would have, not knowing one plant from another. After much misinformation, many mistakes and much time studying, the list was ready to go out to the growers. The first years were spent in supplying seed brokers.

There are many problems that arise in harvesting seed; I will attempt to give a few that cover the wide ranges of methods used.

Many of the trees and shrubs do not bear fruit every year and some will go many years before they set a crop. A good example of this is *Araucaria bidwellii*, which has a very good crop about every fourth year; in between, the crop is almost nil.

The method used in harvesting *A. bidwellii* is to gather the cones from the ground, or from the trees when the cones are beginning to fall very heavily. These are brought into the yard and as they fall apart, each petal is handled separately. There

are many empty seeds, and these must be separated from the viable seed. Cleaning steadily, one can get about 3000 seeds in 8 hours. These seeds must be kept fresh, with the moisture content at 60%, or the seed loses its viability. This is a good species to illustrate one of the biggest problems a seed collector faces; this is to let the grower know how best to plant and care for the seeds. With *Araucaria bidwellii*, the seed is covered just enough to hold it in place. Then after about one month you dig up a small root or tuber and plant it with about a quarter of an inch above the soil line in the container. This gives you a plant in a short while. Otherwise it takes up to one year for the leaf shoot to come out above the soil level.

Cedrus deodora seed has always been a problem. Imported seed, after its long transportation period and fumigation, has a low percentage of viable seed.

After much looking in a very wide range of climatic conditions from San Diego to Oregon, sufficient trees were located that would give a crop each year. First there must be a rain in October, and more than one tree in a locality is necessary to insure good pollination. In August of the following year you can start checking the cones. At this time they are starting to firm up from the milky stage of the immature seed. Along in mid-September or the first of October the cones will start to pop (shatter) and the seeds will be lost. You have to work fast when the cones are ready to harvest. The way to do this is to climb the tree with a pole ten feet long and a strong curved hook attached at one end. A quick pull will usually get the cones from out at the ends of the limbs. The smaller trees are best for ease in picking.

After the cones are gathered, they must be put in the sun so that the pitch will dry and the cones can be broken. This must be done with care, so that the seeds are not damaged. This is done by hand — using a hammer to open the cones. Next is the screening so that the seed can be separated from the bracts. This presents quite a problem since the wings on seeds are about the same size as the bracts. With $1\frac{1}{4}$ inch wire screen you can get about $\frac{3}{4}$ of the bracts out of the seed at the first screening. The next screening is done with a $\frac{3}{4}$ inch hardware cloth, and this gets the rest of the bracts and part of the wings. Removing the rest of the wings is done by putting the seed in a sack and working them gently back and forth and around, then blowing the wings from the seed. Next, increase the velocity of the wind and by so doing you can remove the empty seed from the viable seed. For storage of *Cedrus* seed the best method is to mix the seed with about $\frac{1}{3}$ bracts and $\frac{2}{3}$ seed in paper cartons of about 3 cubic feet capacity. In this way the seed can be kept six to eight months without loss of germination, as long as the seeds do not become overheated or lose their moisture.

Mahonia aquifolium is an unpredictable plant. It is the state flower of Oregon, and is spread all over the state. About the end of July is the best time to gather the seed. After many

years of travelling along Oregon's highways and secondary roads the locations of many acres of *Mahonia aquifolium* plants have been found. There are a few large groupings of this plant but most are found in patches along the fence lines and roadways. A large percentage of time involved is in travelling along the roads looking for a patch that is covered with berries. We use twenty-gallon plastic pails and a stick about two feet long. Gather a bunch of stems in the pail, and hit the stems with the club till the berries fall off into the pail. This is much more simple than picking by hand and more productive. You can pick about 400 pounds in a day this way but when the crop is poor it may take a week to get half that amount.

To clean the seed you can use a vacuum cleaner. At the right speed this will mash the berries and release the seed. Wash and drain the seed but do not dry. Now they are ready for planting or storage.

To obtain *Philodendron* seed, first you have to consider the pollination of the flower. After about three months, the fruit will ripen. This occurs when the upper part of the fruit falls off, leaving the lower part for the birds to eat and distribute. At this time, cut the fruit from the plant and remove the berries into a cloth sack. Tie the sack tight and work the juices and pulp through the mesh of the sack till you have only seed and the large parts of the fruit left. Screen this from the seed, wash and put out to dry in the shade. After the seed is dry, store in an air-tight, dark container.

Pine seeds do not present too many problems. The number one job is to get the cones at the right time. The cones are gathered by climbing the trees and picking by hand. Some cones open easily during the heat of a forest fire; the next best method is to take them to the desert. With a temperature of 110° in the shade and, of course, no shade, the cones open rapidly. *Pinus radiata* cones, under the right conditions, will open in one day. All that is left to do is wing the seed and blow the empty hulls out of the good seed and they are ready for planting or storage. Some conifer seed, like *Sequoia sempervirens*, can be shaken from the trees. All you need for this is enough tarp to cover the area around the tree. A good material for tarp is polyethylene sheeting. The weather must be right to successfully gather seed this way. You climb the tree, and starting at the top, when the wind is in the right direction, shake the limbs, completing the work before the wind changes.

Harvest time is an ever-changing time. Some plants that have been transplanted to our Western shores just don't know when to flower and the seed to ripen. Some will have a harvest time variation of two to three months or more, so you have to check on your seed sources every so often — first to see if there is going to be a crop and then when to harvest the seed. Sometimes wind or heavy rainstorm will destroy the crop and some of these sources are four or five hundred miles away. The only way to overcome this is to have many different climatic condi-

tions. This will give different maturity times and give one a better chance.

Another example is *Arbutus unedo*. The plants might be ready for seed harvest any time of the year. First one must find a tree with good character and a heavy crop of fruit. When the fruit starts to drop, pick it from the ground at least once a week. Wash the small seed and pulp through a $\frac{1}{8}$ inch mesh screen, then through a small-meshed window screen. This will wash the small sand-like material from the seed. Dry inside, out of the sun, and then keep under refrigeration until planted.

Soft seeds must never be exposed to sun or heat. Most seeds of soft-fruited plants should be dried inside or kept moist until planted. Other seeds must be cleaned and planted as soon as possible. *Syzygium paniculatum* or *Eugenia myrtifolia* are good examples of this. Just spread a tarp under the tree, climb up the tree, shake it vigorously and if the berries are ready, down they come, with flowers, leaves and stems. Blow the leaves and flowers from the berries, then mash the berries and wash the fruit pulp from the seed. Keep the seed moist until planted. Permission to gather seeds in most instances is no problem. Most home owners are happy to let you have the seed. Often it is a problem to explain for what purpose you are collecting seeds, since some people do not analyze how a nurseryman gets his plants. Some think all nursery plants grow from cuttings only.

MODERATOR DOBBINS: A very interesting talk, Gene. Now our last talk this morning will be by David Roberts of El Modena, California, who will discuss a subject we do not hear about often — propagation of ferns. David:

MODERN PROPAGATION OF FERNS

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Two decades ago, commercial fern sporing firms in the West were generally small, "hit and miss" operations with insufficient scientific knowledge and capitalization to insure consistent production in an expanding market. Today, increasing availability of new insecticides and fungicides, as well as ample help from State Universities, County Agricultural Offices, and private soil laboratories, contribute much to our knowledge and efficiency.

With all this help at our back those of us in the trade still have our everyday problems in this devious art of artificially encouraging sporogenesis. It is through exchanges of information, such as we are participating in today, that difficulties will be alleviated or resolved.

To begin let us review and discuss some of the mysteries about ferns that botanists have unfolded for us.