PROBLEMS OF SEED AND POLLEN COLLECTION, SHIPMENT, AND STORAGE

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Seed collection is a subject familiar to all foresters and one which usually presents few problems. Some of you, however, may have had little opportunity to become acquainted with the techniques of handling pollen. For these reasons I shall touch very briefly on the first phase of my subject and then devote the remainder of my time to a discussion of the problems connected with pollen collection, storage, and shipment.

SEED COLLECTION AND STORAGE

When collecting seed for genetics work it is important to remember that extraneous factors may influence the results of progeny testing; hence, the effects of these factors must be kept at a minimum. Requests for cooperation in the collection of seed should be accompanied by recommendations for the handling of the collections; these recommendations should be followed as closely as possible. Between the time of collection and germination, seed quality can be affected markedly by extraction, cleaning, and storage treatments, The more these modifying effects can be controlled, the better. Generally speaking, therefore, the most desirable procedure is to have the seed extracted, cleaned, and stored by one agent.

Seed storage techniques have been worked out for a considerable number of species, and improvements are being developed all the time. Seed of many tree species can be stored for 1 or more years with little loss of viability if they are held in sealed containers at temperatures between 34° and 50° F. Recently it has been shown that seed of Douglas-fir, some pines, and other species can be stored in canvas bags if temperatures are kept well below freezing. With temperatures about 0° F,, the seed was stored for 3 years with little loss of viability; storage at 12° and 25° F. gave considerably poorer results. It is probably safe to say that satisfactory storage conditions can be developed for seed of most species.

POLLEN COLLECTION AND STORAGE

For pollen extraction, the usual procedure is to collect flowering branches shortly before the pollen is shed in nature and to force and clean the pollen indoors prior to shipment. Tree breeders have developed fairly elaborate equipment for these procedures; but when only a few relatively small samples are being handled, the only equipment necessary is some clean sheets of brown wrapping paper, a glass jar with water, a couple of small vials, and a small piece of cheesecloth. The work should be done in a heated room with as little air circulation as possible. The

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cut branches with flowers are placed in the jar of water on the brown paper. After some time the anthers open, and when the branches are tapped lightly the pollen will drop on the paper. It is then transferred to a vial. The vial is covered with a double layer of cheesecloth, and the pollen is shaken out on a clean piece of paper. Passing it through the cheesecloth once or twice should clean it sufficiently for shipping.

Any small, clean glass bottle, vial, or test tube can be used for shipping. Such containers should be closed with a cotton plug and not with a rubber stopper or cork. I have found it best to furnish cooperators with shipping containers and vials. A short piece of a 2x4 with holes drilled to fit the vials (20x70 mm,) makes a handy shipping kit. Sometimes a small amount of "Drierite" or other desiccant is added, but for airmail shipment (and pollen should always be shipped by air where long distances are involved) this is not necessary and does more harm than good.

Thus, the extraction of pollen usually is a simple matter. However, when you receive requests for pollen, you will find that the breeders aren't satisfied with a shipment of pollen at just any time--they want it by a certain date, in time for their pollinations. Often their season will be considerably advanced compared to yours. This means early forcing which, in many species, becomes a real problem because, generally, the earlier material is taken in for forcing the longer will the forcing take and the more chances will there be for the flowers to dry out before pollen is shed.

Early forcing necessitates careful handling of the cut branches. The basal ends of the branches must be kept clean by frequent pruning, and the water should be replaced after each pruning. Possibly early development can be induced through some of the chemical treatments used by the flower growers, but to my knowledge, none has been used as yet by the tree breeders. Last year, however, we did some experiments with eastern hemlock in Connecticut trying to speed up development of cut branches with artificial illumination. We found that pollen would shed as much as 10 days earlier from cut branches exposed to a 20-hour light period than from those exposed to the normal daylength of 12 to 13 hours.

This method may be helpful in other species also. It is simple, and only a very low intensity of light is required. We used a 25-watt bulb connected to a time clock, but continuous illumination night and day probably would give almost as good results as the 20-hour daylength.

Another way to overcome the difference in time of pollen shedding between two localities is to store pollen from one year to the next. Pollens, however, vary in their ability to withstand storage. Some are so short-lived that it is doubtful whether we can ever store them for a whole year; others can be stored for long periods without difficulty. Pine and eastern hemlock pollens, for example, can be stored at 50 percent relative humidity and about 40 F. for at least a year with little loss of viability. High temperatures and low relative humidities both are detrimental to stored pollen.

When stored pollen is used, its viability must be determined prior to pollination. The germination of some pollen is easily tested by suspending it in a liquid medium, placing droplets of the suspension on a microscope slide in a moist chamber, and incubating it at relatively high temperatures. For pine pollen, a germination temperature of 79° F. has been recommended; chestnut pollen germinates at temperatures between 82° and 99° F.; and hemlock pollen gives good results at room temperatures. The media used range from simple ones, such as distilled water or sugar solutions in concentrations of from 1 to 20 percent, to complex nutrient solutions. For each kind of pollen to be tested, the optimum combination of conditions must be determined through experimentation. When that has been accomplished, one still is faced with the problem of interpreting the results obtained in vitro in terms of pollen behavior in vivo. Thus, pollen storage and testing of viability may be rather complicated, and attention should be given to the development of better forcing techniques.

To summarize, let me say this: As time goes by, the forester in the field will be called upon more and more frequently by geneticists for help with seed and pollen collection. Let us remain friends. The geneticists should limit their requests for material and information to what is essential, and the foresters should accept their fate and attempt to fulfill reasonable requests in spite of all the inconvenience it may entail.