# BOTANICAL ASPECTS OF POLLEN AND SEED COLLECTION

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According to various authors of articles published in recent years, the first artificial hybridization of pine species is said to have been accomplished and reported by a German worker about 100 years ago. Dr. J. W. Duffield has informed me that he had the opportunity recently to consult the original article reporting this work, and his translation turned up a most interesting and significant point.

In the account of the method used, the author states that in the spring of the year he collected the pollen of one species of pine and applied it to the receptive female strobili of another species. He then goes on to say that in the autumn of the same year he extracted the hybrid seed from the carpellate cones.

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Since it is a well-established morphological fact that pines require 2 years to mature their cones, the conclusion is inevitable that hybrid seed could not possibly have been harvested in the same year that the pollinations were made. And, needless to say, the worker concerned employed a labeling method that cannot be recommended.

Although this is a somewhat extravagant example, it does serve to emphasize the self-evident fact that workers concerned with the manipulation of tree pollen and seed must possess something more than a superficial botanical knowledge of the plants with which they work.

In this day and age I have no doubt that those investigators directly engaged in tree improvement studies are intimately familiar with the taxonomic and morphological characteristics of the species with which they work. But this very familiarity may frequently in itself lead to delays and errors through a failure to recognize that others, especially cooperators outside the botanical fields, usually do not have the specialized and detailed botanical knowledge of a species or genus that the worker may possess.

I recall that one of Bill Cheyney's favorite stories concerned an old pulpwood operator in northern Minnesota who had spent most of his active life cutting spruce. One day in late spring Cheyney visited him on one of his cutting operations, and the logger showed him several small immature female cones he had picked from the terminal portion of the crown of a felled spruce. He said that he had seen these things on spruce from time to time for the past 30 years and wondered what kind of "bug" caused them.

During the past several. years I have had occasion to request seed collections of quaking aspen from a considerable number of foresters in the state and federal services. One of the early and unforeseen 'results during the first year was the receipt of a surprisingly large percentage of male catkins which had been laboriously collected from the ground. Accompanying notes in some cases explained that late frosts had apparently killed the fruits at an early stage which explained their small size and lack of seed. Others were downright and frankly doubtful that they had collected the right material.

I am pleased to report that almost without exception highly suitable material at the correct stage of development was eventually obtained from all such collectors in a subsequent year. I learned, however, that it pays to provide explicit instructions since the less showy flowers and fruits of woody plants are, as a rule, unfamiliar to those foresters without special taxonomic or morphological interests. Incidentally, the problem of providing an accurate description of female catkins at the proper stage of development for collection was solved by simply mounting herbarium specimens of the catkins on 3x5-inch cards and enclosing them with the request letters.

I might mention in passing that the aspen seed requests turned up some rather interesting information on the question of the frequency with which the Rocky Mountain form of quaking aspen produces seed. Early replies to some of my seed request letters to ranger stations in the West reaffirmed the popular impression that Rocky Mountain aspen simply doesn't produce seed or, if so, only at infrequent intervals. I was therefore advised that there was no point in looking for seed. Nevertheless, I was successful in getting most of the potential cooperators to check on the matter at firsthand. As a result, a considerable number of collections were made the first year. Subsequently, over a 4-year period, several seed collections were obtained from each of the western states in which the species occurs. The idea that the western form of aspen is fruitless is apparently most prevalent in the southern Rockies where it occurs at elevations of 9,000 to 10,000 feet. At these elevations the trails are not opened until well after the flowering period, and even thereafter visitors are few and far between. Largely for this reason, I think, plus the fact that root suckering is an obvious and important method of propagation, the idea of aspen sterility in this region was early developed and has long persisted.

With reference to pollen collection, I should like, in closing, to make brief reference to a method of flower forcing which I think has much promise for coniferous species and those hardwoods the flowers of which cannot be forced successfully on cut twigs in the greenhouse.

Since it is frequently necessary to obtain pollen from a proposed male parent in the field in advance of the receptive period of the proposed female parent, a method of field forcing has very definite usefulness. Conversely, it may also be desirable to force female flowers under field conditions.

Early in the spring of 1953 we successfully forced a female bigtooth aspen into receptivity about 2 weeks ahead of schedule by simply covering a portion of the crown with a black tent made of a windproof rubberized material. The tent served as a heat trap, and the enclosed female flower buds developed well in advance of the uncovered buds. Our objective in this particular case was to effect a cross in the field between bigtooth and quaking aspen, the flowering times of which are separated by a 10- to 14-day interval. The cross was, in fact, effected.

Although I am not aware that this technique has been applied to conifers, I see no reason why it should not prove equally successful. In those cases where female strobili are concentrated in the tip of the crown, as in spruce, special conical tents could be easily prepared and applied. By this method crosses might be effected without recourse to bagging since pollination would be possible well before the air became contaminated by undesired pollen. Similarly, such a tent applied on lower branches in the crown could be used to force development of the male strobili.