

Pollen Equipment for Seed Orchards

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A cyclone dust collector that uses centrifugal force to separate fine solid matter from the air has successfully collected pollen in Forest Service seed orchards. Preliminary field tests have shown that it can collect pollen in the quantity needed with minimal damage to the pollen. With 4 workers, the cyclone dust collector can be used to collect up to 6 liters of pollen per hour under optimal conditions. A tractor-mounted air duster modified for use as a pollen applicator is being evaluated. Tree Planters' Notes 42(4):4-5; 1991.

Over 25 years ago, the Forest Service began establishing a network of seed orchards of genetically superior trees. Now that these trees are in the cone bearing stage, the problem of protecting the genetic quality of the seed is of prime importance. About 40% of the seed now produced in seed orchards can be the result of fertilization by pollen blown into the orchard from outside sources. This "outside" pollen threatens the decades of work accomplished by tree breeders in upgrading seed quality. For this reason, equipment and methods to control orchard pollination are essential to Forest Service managers.

In 1989, the National Forest Regeneration Committee directed the Missoula Technology and Development Center (MTDC) to investigate ways of developing orchard pollen collection and application equipment. This work is being done in conjunction with Don Copes of the Pacific Northwest Station in Corvallis, Oregon, and Floyd Bridgewater of the Southeast Station at Raleigh, North Carolina.

Pollen Collection

Methods of collecting and disseminating pollen have traditionally involved cutting male flowers (catkins), drying them, and then shaking the pollen grains from the flowers. This pollen is then applied with hand-held applicators to single or small clusters of female flowers. The female strobili are then covered with bags to exclude windborne pollen.

Orchard managers needed a method of collecting a large supply of pollen and an efficient means of applying that pollen to the female flowers on target trees in a very short period of time. Geneticists call

this "supplemental mass pollination." It allows them to protect the genetic quality of orchard seed by minimizing the effects of non-orchard pollen and also increases orchard productivity by assuring adequate pollen supplies at the peak of female flower receptivity.

Various mass pollen collection techniques have been tried. In one example, the lower portion of a single tree was enclosed in a canvas-covered catch frame, then the tree was shaken to dislodge pollen. In other cases air was blown through the tree and the pollen collected on the far side of the enclosure. With these methods the actual removal of the pollen from the capturing fabric still posed problems. Setting up and dismantling the barriers around each individual tree proved time-consuming and labor intensive. Vacuum equipment with collector bags or similar separation methods also proved ineffective. The fine pollen grains quickly form a thick blanket layer on the inside surface of the bags and block the air passage.

MTDC found the solution in a cyclone dust collector that uses centrifugal force to separate fine solid matter from the air (figure 1). The collector is ideally suited for pollen work. A Model 20SN31P Cyclone Dust Collector manufactured by the Aget Manufacturing Company of Adrian, Michigan, was modified for field operations with an 8-horsepower gasoline engine as its power source. This unit was mounted in the bed of a pickup truck and configured with



Figure 1—Pollen collector.

four collection hoses. These hoses were fitted with 10-cm by 35-cm (4-inch by 14-inch) vacuum heads and extension poles that allow an operator to reach approximately 7.6 m (25 feet) into a tree's crown. With this equipment, 4 workers can collect 6 liters of pollen per hour. This pollen can be easily cleaned and used immediately, or air-dried and placed in a freezer for long-term storage.

The cyclone collector operates very effectively with Douglas-fir pollen. However, species of pine, such as sugar, white, and lodgepole, have pollen grains with different aerodynamic characteristics that require minor modifications to the collector. Work is continuing in an effort to adapt the collection equipment to loblolly pine. Additional tests will be necessary to determine the effectiveness of the cyclone dust collector to various other tree species.

Pollen Application

This spring, a tractor-mounted air duster was tested as a supplemental mass pollen applicator (figure 2). This duster utilized a squirrel-cage type blower with hopper and feed mechanism and operated from the tractor's power take-off system. It was originally designed as a vineyard duster for pesticide and fertilizer application. MTDC modified the feed system and blower outlet so that the pollen expelled from the machine could be directed high into the crown of orchard trees. Evaluation of this year's treatment will determine the effectiveness of this method of supplemental mass pollination.

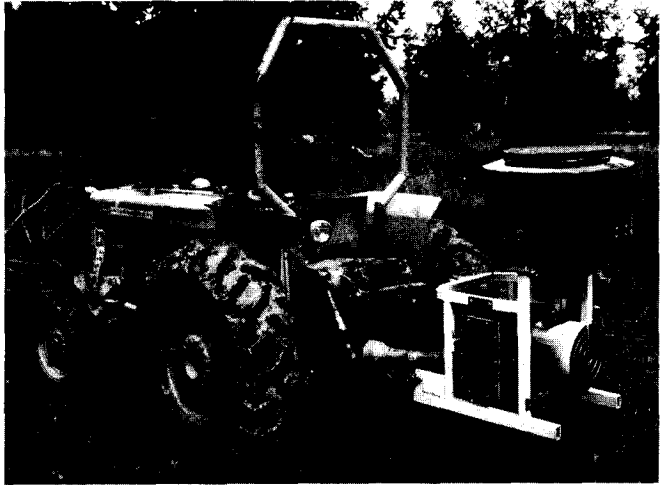


Figure 2—Pollen applicator.

In FY 1992, MTDC will continue to work with both the Pacific Northwest and the Southeastern Experiment Stations to perfect the cyclone collector and the orchard blower applicator. Drawings and test results will be published.

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