



## Suitable Pollen Isolation Bags for Selective Breeding of Conifers

Mary Ann Davies, Project Leader

Tree improvement programs use controlled pollination when mating genetically superior trees to improve desirable traits. Such traits include disease resistance, cold hardiness, and fast growth. The selective breeding process requires isolating female pine cone flowers (technically known as strobili) on superior parent trees.

The branch tips of trees used in selective breeding are placed inside isolation bags to prevent unwanted windborne pollen from reaching the female pine cone flowers. Forest Service nurseries use many of these isolation bags every spring.

Bags are placed over the ends of tree branches (figure 1) when the pine cone flowers begin to develop. The timing varies among species and depends on seasonal increases in temperature and day length. Pollen from superior parent trees is collected, processed, and stored so that it is ready to use when the female pine cone flowers need to be pollinated.

### Highlights...

- Pollen isolation bags used in selective breeding of conifers have become difficult to find.
- Two isolation bags were evaluated at Forest Service nurseries.
- Both bags worked well, although the bag with a window flap to keep sunlight out cost five times as much as the other bag.



Figure 1—Isolation bags are placed over pine cone flowers on the ends of tree branches.

Isolation bags with a clear plastic window allow nursery workers to monitor the development of female pine cone flowers (figure 2) without removing the bag. The window also ensures that valuable pollen is used efficiently when it is injected into the bag through the clear window (figure 3).



Figure 2—Pine cone flowers, seen through the window of an isolation bag.



Figure 3—Pollen collected from superior male pine trees is applied to female pine cone flowers inside an isolation bag.

Isolation bags remain on selected trees long enough to ensure that the pollinated pine cone flowers inside are no longer receptive to other unwanted pollen. This may be as long as 5 weeks, so the bags must withstand wind, rain, and sun while protecting the female pine cone flowers that will become seed-bearing cones.

Isolation bags have become harder to find, because some manufacturers have gone out of business or merged with companies specializing in other types of packaging. Some nurseries reported that the glued seams of isolation bags delaminated, wasting not only materials and many hours of labor, but also pollen, which can be in short supply. The Missoula Technology and Development Center (MTDC) was asked to search for suppliers of high-quality isolation bags.

Isolation bags need to be made with special wet-strength paper, weatherproof glued seams and a clear viewing window. Isolation bags also need to allow gases to move through them. Air and water vapor inside the bag need to be at equilibrium with the outside air to prevent heat from building up.

Three distributors that supply isolation bags were located. Bags were purchased by MTDC and sent to the Forest Service's Coeur d'Alene Nursery near Coeur d'Alene, ID, and to the Dorena Genetic Resource Center near Cottage Grove, OR. To prevent any bias, the bags were numbered and the location of the suppliers and the cost were not disclosed.

## Findings

The nurseries only evaluated two of the three bags (figure 4). The clear polyethylene bag was rejected immediately. This bag would have allowed too much sunlight, overheating the developing pine cone flowers. The remaining two types of isolation bags were used to enclose pine cone flowers during their development. The nurseries reported that both of these bags were suitable.

Sources of suitable isolation bags for selective breeding of pine trees include:

### **PBS International**

Salter Rd.

Eastfield Industrial Estate

Scarborough

North Yorkshire, United Kingdom YO11 3UP

Web site: <http://www.pbs.co.uk>

E-mail: [sales@pbsinternational.co.uk](mailto:sales@pbsinternational.co.uk)

Size: 6 by 20 by 6 inches with a clear window, with or without a window flap (PBS3d/50)

Cost: 2,000 bags, \$3.55 each; more than 2,500 bags, \$3.37 each

### **Orchard Wholesale**

3411 Springview Place

Armstrong, British Columbia V0E 1B8

E-mail: [orchardwholesale@canada.com](mailto:orchardwholesale@canada.com)

Size: 8.5- by 24-inch white kraft paper with a 4- by 22-inch clear window

Cost: 400 bags in a case for \$0.69 each

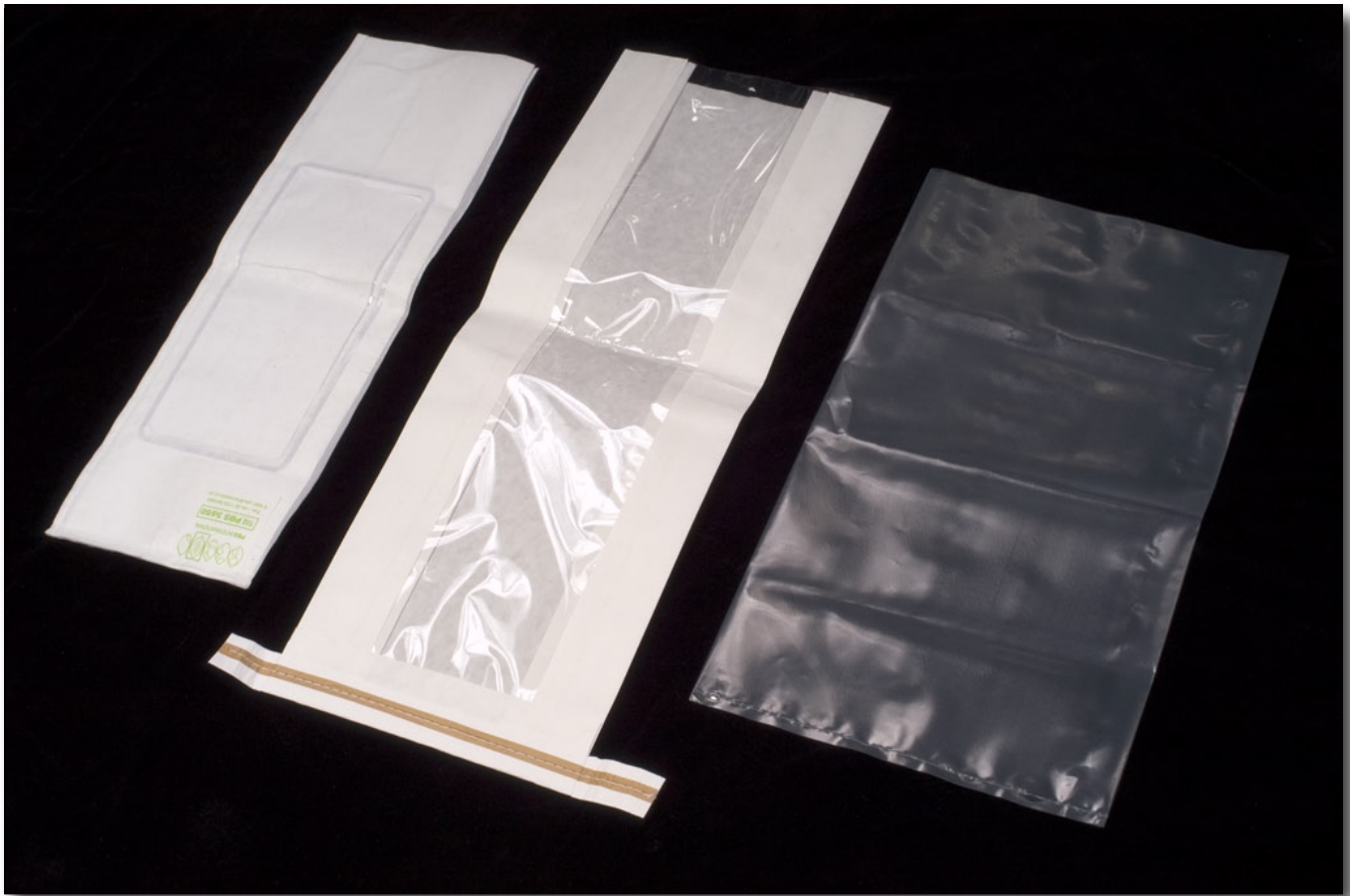


Figure 4—The PBS International isolation bag (left) and the Orchard Wholesale isolation bag (middle) were considered for evaluation. The clear plastic bag was not evaluated because too much heat would have built up inside.

### **Comments From the Field**

The PBS International isolation bag was probably the crew’s favorite for durability because the flap that could be used to cover the window offered extra protection from heat buildup. The bag’s price may prevent it from being an option.

The Orchard Wholesale isolation bag is the same style that we used in the past. The material and glued seams held up to the wind and rain. The bag’s size is adequate for most branches, but a larger version would be useful for enclosing two or three adjacent branches. Only 10 to 20 percent of the bags would need to be larger. About 1½ to 2 inches wider and 4 to 5 inches longer would be about the right size for the larger bags.

### **Acknowledgments**

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## About the Author

**Mary Ann Davies** received a bachelor's degree in mechanical engineering with a minor in industrial and management engineering from Montana State University. She worked in the Pacific Northwest Region as a facility engineer and as a tramway engineer. Mary Ann has worked in fire management as a crewmember and as a crewboss. She worked for 5 years with the Rocky Mountain Research Station in the fire chemistry and fire behavior groups before coming to MTDC in 1999.

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## Library Card

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Describes evaluation of two types of isolation bags used to prevent unwanted pollen from inadvertently reaching female pine cone flowers during selective breeding. Both of the isolation bags worked well, although one bag cost five times as much as the other. The tech tip includes the information needed to order both types of bags.

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