



An Improved Method for Collecting and Monitoring Pine Oleoresin

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A new method for collecting and monitoring pine oleoresin has been developed through a cooperative project involving the Missoula Technology Development Center (MTDC), Southern Research Station (Brian Strom, research entomologist), and the Forest Health Technology Enterprise Team. The new sampling unit (figure 1) is cast from rugged plastic. It provides a closed system

that resists sample contamination from outside elements (such as falling debris and rain). The sampler is reliable, inexpensive, and reusable. Because the one-time costs of design and mold production have been paid, the sampler is available at a nominal cost through MTDC (contact information below).

Oleoresin yield has become an increasingly popular measure for evaluating the health of pine trees. Oleoresin yield is important for tree survival because it helps trees resist pest damage. In particular, more oleoresin yield appears to increase the resistance of pines to attack by bark beetles and other pests, while its absence frequently appears to result in tree death. More complete evaluation of the relationship between oleoresin yield and pest resistance requires improved methodology that allows standardized samples to be collected under a variety of environmental conditions. This sampler meets these requirements.

Previous collection methods have evolved over years of experimentation, but have continued to rely on open containers (figure 2). Open containers are undesirable because oleoresin samples are exposed to contamination by rain and falling debris. Problems created by open containers are especially troublesome during large experiments, which often are conducted over long periods of time, across large geographic areas, and in all kinds of weather. An efficient sampler will allow experiments to be conducted that previously were considered logistically impractical.



Figure 1—Final sampler design with the fastener holes outside the oleoresin collection area. The sampler directs oleoresin from a wound area on the tree to a plastic 15 milliliter centrifuge tube that screws into the sampler.



Figure 2—One proposed design used a tin funnel tacked to a tree to direct oleoresin into the collection vial.

We had two objectives for the new sampler. First, we wanted a simple, inexpensive device that protected oleoresin samples from falling debris and rain. Second, we wanted a device that would allow us to gather biologically relevant data that could be compared to results of previous studies. The first objective led to a closed container, while the second suggested that we obtain oleoresin using the same type of wound as used in earlier studies, if possible (a 0.13-millimeter round hole in the sapwood face).

Sampler Design and Development

Keith Windell, an engineer at MTDC, used computer-aided design software (Solidworks) to generate sampler designs. Oleoresin was collected in a standard laboratory centrifuge tube (15 milliliters), selected for its wide availability and low cost. Our initial prototype was attached to the tree with a single screw in the center of the wound (figure 3). This design was preferred for its simplicity. However, testing



Figure 3—An early design had a single fastener screw in the wound zone. This design was abandoned because the screw was causing more resin to flow than would have flowed otherwise.

demonstrated that the screw in the center of the wound nearly doubled the oleoresin yields compared to those produced with the method used previously (figure 4).

The next prototype sampler (figure 1) was attached to the tree with two screws outside the wound. Even though the oleoresin leaked from the additional screw wounds, this method did not affect the amount of oleoresin flowing into the centrifuge tube and gave the same results as tests with the sampler used in earlier studies. Small holes (2 millimeters in diameter) drilled through the sampler wall allow air pressure at the face

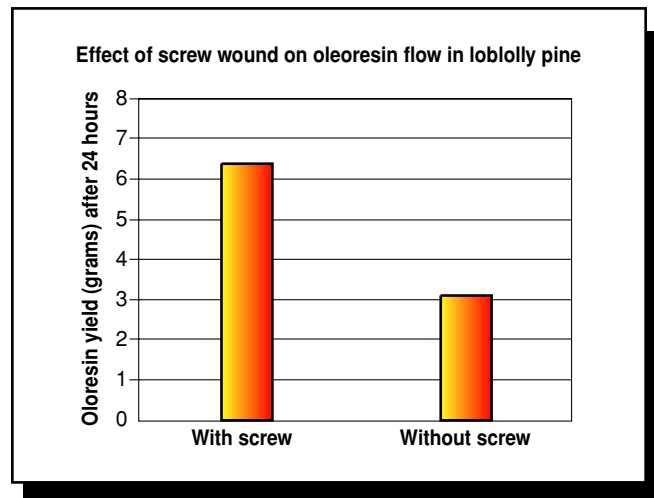


Figure 4—When the screw was in the oleoresin collection zone, trees exuded twice as much oleoresin as when the screws were outside the collection zone.

of the tree's xylem to reach equilibrium with ambient air pressure as oleoresin fills the sample tube. These holes increase the cost of the sampler slightly, but they prevent the flow from changing because of increasing pressure at the face of the wound while the sampler is filling.

Sampler Evaluation

Samplers were evaluated for their ability to protect oleoresin samples from rain and falling debris, and for their ability to produce results that were comparable with data gathered using previous methods. Because rainfall is the major contaminant of samples in the Southeastern United States, we tested watertightness of the seal between the sampler and tree bark. Samplers attached to cut bolts of trees were sprayed with water for 30 seconds using a garden hose. This test yielded about a 6-percent failure rate—excellent, given the stringent conditions and inherent heterogeneity of the shaved bark substrate. We believe that the sampler's failure rates in the field because of rain entering the sampler will be less than 10 percent, and probably closer to 5 percent.

Comparison of oleoresin yields from the new samplers with those previously used showed no difference (figure 5). Yield from the new samplers can be compared directly with open container systems used in earlier studies.

The new sampler is rugged and reusable. It is made from the same plastic as gasoline caps and can be washed in the petroleum solvents that may be needed to remove pine oleoresin. The samplers can be reused without cleaning, but they may be cleaned as desired. Reuse will further reduce the cost of data collection.

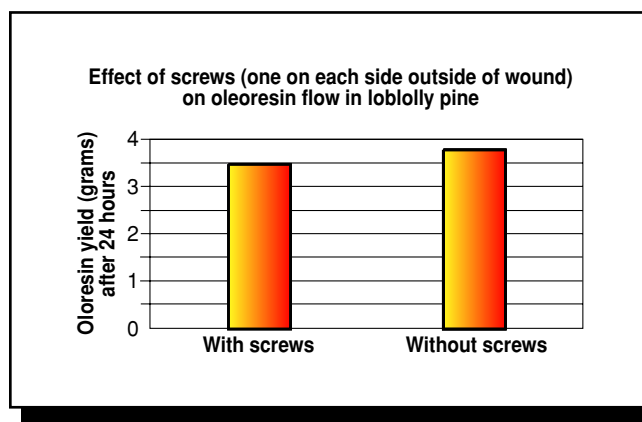


Figure 5—There was no significant difference in oleoresin flow between the new sampler with two screws outside the wound and the previous sampler with no screws.

Sampler Availability and Cost

The new samplers are available from MTDC in lots of 1,000 for about \$1.50 each. They are not kept in stock, so please allow time for them to be manufactured. Centrifuge tubes widely available from laboratory suppliers, typically cost between 38 and 40 cents.

Summary

The new sampler for collecting oleoresin represents an important improvement over earlier samplers. It is reliable, durable, reusable, and inexpensive. Its availability promotes standardization of methods, while allowing data comparisons to earlier studies.

Oleoresin collecting tubes are standard 15-milliliter centrifuge tubes that screw into the sampler. Samplers are easy to use and create a water-resistant seal with the tree, protecting the vast majority of samples from contamination by rainfall. Samplers are available from MTDC in lots of 1,000 for about \$1.50 each.

About the Authors

Dick Karsky has been the forest health protection program leader since the fall of 1999. Dick has been a project leader at the Missoula Technology and Development Center in the resource areas of range, cooperative forestry, engineering, fire, reforestation and nurseries, residues, recreation, and forest health protection. He received a bachelor's degree in agricultural engineering from North Dakota State University and a master's degree in agricultural engineering from the University of Minnesota. He worked for private industry before coming to the center in 1977.

Brian Strom is a research entomologist for the Southern Research Station in Pineville, LA. He received a bachelor's degree in forest science from the University of Wisconsin, a master's degree in entomology and forestry from North Carolina State

University, and a Ph.D. in entomology from Louisiana State University. Brian has worked in the southern pine beetle ecology, behavior, and management research work unit since 1991.

Harold Thistle received a Ph.D. in plant science specializing in forest meteorology from the University of Connecticut in 1988. He is certified by the American Meteorological Society as a certified consulting meteorologist (CCM), and worked as a consultant in private industry before joining the center in 1992. He served as the center's program leader for forest health protection until 1998, developing modeling techniques that accurately describe transport of pesticides in the atmospheric surface layer and evaluating meteorological instrument systems for environmental monitoring. He now works with the Forest Health Technology Enterprise Team in Morgantown, WV.

Library Card

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Describes a sampling device that can be used to measure resin flow after a small plug of bark has been punched from a pine tree. Resin flow can be a measure of a pine tree's resistance to attack by bark beetles, tiny insects that can kill a tree if enough of

them begin reproducing in the living tissue beneath the tree's bark. The new sampler is sealed, preventing the resin it collects from being contaminated by rain or debris. The amount of resin collected in this sampler can be compared to the amount collected in the old unsealed samplers. The collection vial is a standard threaded centrifuge tube. The sampler costs \$1.50, is reusable, and is watertight.

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