Blackout Cloth for Dormancy Induction

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The use of blackout cloth to create long night photoperiods for the induction of dormancy in certain conifer species has been an established practice for a long time. Its use was suggested by Tinus and McDonald (1979) as an effective technique, and the practice has been commonly used in Canadian forest nurseries for a number of years. Cal-Forest Nursery installed its first blackout system in 1998 after a visit to several Canadian nurseries. Over the next several years, the basic protocols were established. Successful use of blackout requires appropriate equipment and knowledge of appropriate species, initiation timing, and duration.

Equipment and Conditions

The first attempt at Cal-Forest used blackout polyethylene drawn by hand over wires. Despite appropriate darkness and duration, the seedlings did not respond to the treatment due to excessive temperature and humidity during the treatment. Seedlings that are struggling for existence do not respond to daylength treatments.

Following these results, Cal-Forest purchased a blackout system from Cravo Equipment Limited (Brantford, Ontario) that used a breathable black cloth. The reduced temperature and humidity, not to mention the ease of application resulted in successful induction of dormancy in Douglas-fir (*Pseudotsuga menziesii*) seedlings.

The requirements for a successful system are: (1) ability to reduce light level to approximately 3 f-c (32 m-c); (2) breathability to minimize temperature and humidity gain; and (3) ease of application to a large area.

Species

Blackout dormancy induction in our locale is most appropriate for seedlings of Douglas-fir, *Abies* spp., and western larch (*Larix occidentalis*). We have also successfully used it to slow the growth of a vigorous selection of radiata pine (*Pinus radiata*). However, this effect was probably a growth reduction through reduced day length rather than induction of dormancy. The success of application to Douglas-fir seedlings is greatly effected by many factors, including the latitude of the source, whether seeds are from a coastal ecotype, or whether seeds are from a seed orchard. Coastal and orchard seed sources are much less responsive to blackout dormancy induction than more inland sources. Seedlings from lower latitudes are less responsive that those from higher latitudes.

Initiation Timing

At a microscopic level, the effect of blackout dormancy induction can be seen almost immediately. Vegetative cells are replaced by buds scales within a day or so. However, because of the large number of unelongated cells in the meristem, the seedlings will continue to grow in height until the bud becomes visible. Therefore, initiation begins before the seedlings reach the desired height. At Cal-Forest, this is typically sometime in July or early August.

Duration

For responsive species and sources, 3 weeks of 15-hour nights will induce dormancy in 95 to 100% of the seedling population. For unresponsive seedlings, such as orchard and coastal Douglas-fir, 6 weeks of 15-hour nights will induce dormancy

in 70 to 90% of individuals. Protocols for these seedlings are still a work in progress. We shift the "night" period toward morning to reduce the heat load in the greenhouse. In most cases, it is appropriate to end the treatment when terminal buds first become visible by close examination of a sample of seedlings. However, there is no substitute for experience.

Experience

Blackout is a useful tool for growers to achieve a uniform and predictable induction of dormancy in appropriate species. Using blackout, dormancy induction for responsive seedlings does not generally require any water or nutrient stressing of the seedlings. This simplifies the management of the seedlings during this important phase in the production cycle. The ability to choose a wide range of initiation and duration timings has allowed production of a more uniform crop, particularly in stem height.

Early frost hardiness is important at our site. Although the first test of earlier frost hardiness did not provide experimental confirmation, we are certain that the earlier dormancy induction possible with blackout has improved the frost hardiness of the seedlings during the crucial late summer/early fall period.

Growers who are able to achieve their objectives by other methods may find that the cost of the equipment and the hassles of its application are not worth the use of blackout cloth. However, we are satisfied that this is a useful tool on our site and with our seedling mix.

References

Tinus RW, McDonald SE. 1979. How to grow tree seedlings in containers in greenhouses. Fort Collins (CO): USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. General Technical Report RM-60. 256 p.