

Lodgepole pine challenges orchard managers to meet seed demands

Lodgepole pine (Pli) is the dominant species planted in BC, accounting for 39% to 52% of annual provincial sowing over the past decade. Despite a shift to planting other species and species mixes, Pli remains suitable as a plantation species for large parts of the BC interior.

Pli presents several seed production challenges that translate to higher costs and higher risk for orchard businesses working to meet client seed needs. These challenges include difficult picking, low cone production, and few seeds per cone. Cone harvest is laborious because cones are dispersed throughout the crown, and the woody stems, adapted to retain serotinous cones for many years, require pickers to either clip or “twist and pluck” each cone. In addition, Pli rarely exceeds 20 viable filled seeds per cone (FSPC) and often produces from 5-12 in southern BC orchards. This is relative to spruce orchards that average 40 to 50 filled seeds per easily-picked cone.

The low number of cones per tree and seeds per cone require large orchards to meet seed demand. At the current time 57% of the 117 thousand grafted trees in BC orchards are Pli. All these grafts are still meeting less than half the seed demand for this species. New orchards established at Skimikin by the FLNRO and by Vernon Seed Orchard Company near Quesnel will increase supply, but a recent analysis of seed supply and demand shows that either higher production or more orchards are still required.

Increasing the number of cones per tree and FSPC has been the subject of research supported through the FGC. This work includes using plant growth regulating hormones such as gibberellic acid and IBA to stimulate increased flowering. Although still under development, large-scale trials of gibberellic acid alone increased cone production by about 35%. Trees can only be treated every 3 or 4 years, however, so overall orchard production increases will be closer 10%. Refined hormone treatment methods are expected to give higher levels of success in the future.

A subject of much research over the past 15 years is the relatively small numbers of viable or filled seeds per cone (FSPC). This is a very challenging area of investigation due to many causes, with each cause taking on a different level of importance in different seed years. Research has suggested that self-pollination reduces FSPC as there is a natural genetic barrier protecting trees from inbreeding. Other research has shown that seed predation by the western conifer seed bug (*Leptoglossus occidentalis*) also has a large impact on FSPC some years. In younger orchards, or in years when wet weather is unfavourable to pollination, insufficient pollen reaching the emerging “flowers” can be a problem.



Top - Rick Hansinger in a 5,000-ramet Pli orchard in the Kettle Valley operated by the Hansinger family under contract to FGC-owned SelectSeed Ltd. **Left** - Lodgepole pine “flowers” (*Megasporangiate strobili*) at the stage of pollen receptivity. **Right** - a transverse cut of a nearly-mature lodgepole pine cone showing healthy filled seeds (white) and empty seeds (black) caused by either *Leptoglossus* predation, self-pollination, or an unknown cause. (Photos J. Woods).



Research has also investigated causes such as high temperatures, humidity, and irrigation, and generally shown that these do not strongly influence FSPC. At the current time, low FSPC appears to be primarily caused by a combination of *Leptoglossus* predation, poor pollination, and self-pollination, with a chance that that other currently unknown reasons are contributing.

Meeting FGC objectives for select seed use and genetic gain requires higher production from Pli orchards. Orchard managers continue to work to meet this challenge, but we're not there yet.

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