

Highlights

of the 14th

International Christmas Tree Research and Extension Conference

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PHOTOS BY HEIDI LINDBERG AND BERT CREGG



Researchers and Extension Personnel from North America, Europe, and Australia met in Quebec City Canada August 26-30, 2019 for the 14th International Christmas Tree Research and Extension Conference. The conference was organized and hosted by Quebec's Center of Expertise in Ornamental Horticulture (IQDHO). Marylaine de Chantal was the coordinator of the conference organizing committee that included Dominique Choquette, Chloé Gendre, Gérald Couture, Larry Downey, Julie Bilodeau, and Julien F. Guertin. As in the past, the conference program included field tours, oral presentations and poster presentations.



Above: Clonal propagation of white spruce via rooted cuttings at Saint-Modeste nursery

Left: Container-grown Fraser fir seedlings at Productions Résinex

Christmas tree production in Quebec

Quebec is the largest Christmas tree producing province in Canada, with more than 20,000 acres in production. Operations range in size from small, choose and cut farms to about a dozen large wholesale farms of more than 500 acres each. As with most of eastern Canada, production of Christmas trees in Quebec is largely focused on production of balsam fir for export to the U.S. The bulk of Quebec Christmas tree exports to the U.S. go to Massachusetts and New York. Christmas tree plantations in Quebec are mainly established based on planting seedlings and transplants. This is in contrast to Nova Scotia, another major Christmas tree producing province, which still relies heavily on natural regeneration of balsam fir from seed trees.

Field tours

The first field tour of the conference included visits to a private nursery (Productions Résinex, Inc.) and a provincial government nursery (Saint-Modeste Nursery). These nurseries

produce conifer seedlings primarily for reforestation but also provide seedlings for Christmas tree and nursery production. An over-riding theme of nursery production in Quebec is a rapid shift from field to container production. In 2017 the province produced 150 million seedlings, of which 96% were grown in containers. Personnel at both the private and provincial nurseries cited production costs, particularly labor, as the main driver of the shift to container production.

Productions Résinex produces 4,000,000 trees annually. Their principle species are balsam, Fraser, Canaan, and hybrid firs as well as white-cedar. Production starts in 12 greenhouses and then seedlings are finished outside. Trees are grown in containers ranging from 300 cc to 1500 cc. As with Productions Résinex, Saint-Modeste has transitioned almost entirely to container conifer production including firs, pines and spruces. The nursery is growing various cover crops but dealing with excess land is a current management concern because container production occupies only a small fraction of the land formerly



François Gendron discusses Integrated Pest Management strategies

used for seedling and transplant beds. The nursery produces 10,000,000 plants annually, including 2,000,000 genetically improved spruces, including white spruce produced from somatic embryogenesis. Currently the embryogenesis systems are not sufficient to meet the needs for clonal stock, so production is augmented with propagation from cuttings. The nursery also produces seedlings from the provincial seed orchard. While we were visiting, nursery



Quebec nurseries produce 150 million seedlings annually; nearly all are container-grown.



Close up of *Abies koreana x lasiocarpa* hybrid



CTRE participants visit hybrid fir plantations at Downey Nursery and Tree Farm

personnel were in the middle of processing a bumper crop of cones.

Downey Nursery and Tree Farm was the site of the second field tour. Larry Downey and his son, Jimmy operate the nursery and tree farm, which produces transplants and Christmas trees for the wholesale market as well as choose and cut Christmas trees. Larry currently serves at the president of the Canadian Christmas Tree Growers Association and is a frequent speaker at programs in

the U.S. A signature of Downey Nursery is an emphasis on genetic selection and development of interspecific hybrids. Larry has developed a series of balsam fir hybrids and has begun to back-cross some of these to produce (Korean x balsam) x balsam hybrids. Another notable hybrid at Downey's is their Korean x subalpine fir cross, which forms an elegant, blue tree.

Highlights of the scientific program

Researchers presented over 30 oral presentations on a range of topics from weed control to tree improvement. Research from Michigan State University participants (Bert Cregg, Dana Ellison, Heidi Lindberg, Jill O'Donnell, and Monique Sakalidis) will be presented in future *Great Lakes Christmas Tree Journal* articles or at MCTA meetings. Below are some research highlights that may be of interest to *Journal* readers. To see the complete book of abstracts of research presentations for this meeting and past CTRE's, search 'IUFRO Christmas trees' in your web browser and click on 'Publications and References'.

Import/Export pests in the Pacific Northwest

Thomas Whitney (Washington State University) reported on two CTPB-funded projects on regulatory pests. Twig weevil affects Douglas-fir Christmas tree and noble fir bough materials. The weevil is the number one insect pest causing load rejections for exports to Mexico. Whitney's work includes determining diversity of twig weevil populations, developing a degree day model for twig weevil life stages and developing a twig weevil scouting and management guide for growers. Whitney also reported on his work on *Megastigmus*, which infests Turkish and Nordmann seed and has resulted in rejection of seed imports by USDA APHIS. Whitney is evaluating whether heat treatments that are effective in eliminating *Megastigmus* larvae in Douglas-fir seed will work on Turkish and Nordmann firs.

Delphinella in balsam fir

Carole Beaulieu (Université de Sherbrooke) investigated *Delphinella* shoot blight disease, which has been increasing in balsam fir in Quebec. Beaulieu found that two closely-related



Dr. Monique Sakalidis presents her recent work on dead and alive detection of pathogens

fungi, *Sydowia polyspora* and *Delphinella balsameae* occurred in symptomatic branches. However, she determine that *S. polyspora* also occurred on healthy shoots. Her experiments indicated that *D. balsameae* is the main causal agent of fir tree shoot blight in Quebec, while *S. polyspora* is endophytic (a fungus that infects plants but is not pathogenic).

Weed control in NC

Jeff Owen (North Carolina State University) summarized his program on weed control for Christmas tree plantations in North Carolina. Over the past several years growers have increasingly relied on low-rates of glyphosate applied over the top of trees when shoots are not actively growing (chemical mowing). This system has been effective in controlling weeds, especially grasses, and results in establishment of a good understory of clover. Reliance on glyphosate, however, has led to the emergence of glyphosate-resistant weeds, particularly horseweed or mare's tail, common ragweed, and lambsquarters. Recent work at NC State has focused on products with alternative modes of action to glyphosate that can



Larry Downey demonstrates controlled pollination techniques

be rotated without killing clover. Firstrate (cloransulam-methyl) and Harmony (Thifensulfuron-methyl) provided promising levels of selective weed control but are at risk of their own weed resistance issues. 2-4D amine and Detail (saflufenacil) provided alternative modes of action that can be safely used prior to Christmas tree budbreak. Special labels contingent on product rotation will be sought through the IR4 Program.

Elongate hemlock scale

Jill Sidebottom (North Carolina State University) examined the host range of elongate hemlock scale (EHS). EHS is a regulatory issue as crawlers have been identified on cut Fraser fir trees by the Florida Dept. of Ag. Sidebottom exposed plants of potential host species to Fraser fir branches that were heavily invested with EHS. Scales successfully reproduced on eastern hemlock, Fraser fir, blue spruce and Deodar cedar over time. There was minimal reproduction on Virginia pine. EHS settled and developed on several species that did not support continued reproduction. The Florida torreyia, an endangered species, did support initial feeding but

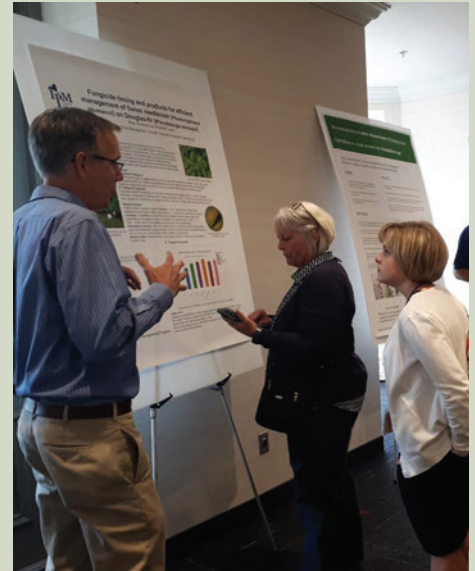


Using mirrors to scout for pests

there was little to no reproduction. Loblolly pine, southern red cedar, spruce pine, sand pine, slash pine, arborvitae, Atlantic white cedar, Arizona cypress, Florida yew (also endangered) and Leyland cypress were not hosts under study conditions.



Scenic Quebec. Like traveling to Europe without leaving the continent.



CTRE participants visit hybrid fir plantations at Downey Nursery and Tree Farm

Strategies to increase noble fir seedling survival in Christmas tree plantations in Oregon

Summer droughts in the Pacific Northwest are increasing in frequency and intensity. Judy Kowalski and Chal Landgren (Oregon State University) have conducted a series of trials to examine techniques to improve survival of newly planted noble fir seedlings. In 2018 they compared survival of 2+ 0 seedlings that were dipped in a root dip (RootEx), sprayed with an anti-transpirant (MoistureLoc), or shaded with temporary shade cloth screens. Mortality at the end of the growing season was 13% for the shaded seedlings versus 31% for seedlings treated with anti-transpirant and 28% for root-dipped seedlings. In a follow up study the researchers tracked seedling performance at two sites with shade, wood-chip mulch or a combination of mulch and shade. At one site (a cobbly loam soil), mulch, shade or mulch + shade increased survival but the effects were not additive; i.e., combination was not more effective than shade or mulch alone. At the

second site, which had a heavier clay loam soil, mulch was more effective in improving survival than shade.

Leader length control in Christmas trees using plant growth regulators

S-ABA (abscisic acid) is a plant growth regulator that is being marketed for a range of horticultural applications from improving shelf life of bedding plants to enhancing color of table grapes. Recently Christmas tree producers in Europe have used S-ABA to control leaders in Nordmann fir. Chal Landgren (Oregon State University) reported on recent trials on S-ABA to control leader growth of noble fir and Turkish fir in Oregon. In the OSU trials S-ABA was applied at a range of concentrations from 0.5% to 6% active ingredient (a.i.) using an Easy Roller to treat terminal leaders when leaders were approx. 10" long. Growth control varied with site and species but growth control (2" or less of leader growth after treatment) was usually achieved at application rates between 1 and 3% a.i. Needle browning and shoot injury was observed at application rates of 4% a.i. and above. Researchers from MSU, Washington

State University, and NC State are collaborating with OSU and Valent on continuing trials to refine application rates, surfactants and formulations.

Nordmann fir seed source trial

Chal Landgren (OSU), Gary Chastagner (Washington State University) and Rick Bates (Penn State) traveled to the Republic of Georgia to initiate collection of seed from various provenances of Nordmann fir. The goal of the project was to establish a series of test plantations around the U.S. similar to the CoFirGE project for Turkish fir. The researches will be looking for collaborators to establish test plantations in 2-3 years when seedlings are available.

Fungicide timing and products for efficient management of Swiss needlecast

Brian Eshenaur and Elizabeth Lamb (Cornell University Extension) presented a poster on their recent studies on managing needlecast in Douglas-fir. Some key points from their work: Chlorothalonil (Bravo Weather Stik)



Made in the shade. Oregon State University researchers investigate the use of shade screens to improve seedling survival. Photo: Judy Kowalski.

was the most effective product amount among those tested (others were Junction, Manzate, Mycoltect, and Tourney). If spray coverage is good, two sprays is all that is necessary for good control. Surprisingly, early spring sprays when shoots were less than an inch provided little benefit and can be skipped. Further details and results from follow-up studies will be presented in later editions of the Great Lakes Journal. ▲



Workers at the Saint Modeste nursery get in the spirit as they process spruce cones from the provincial seed orchard



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