

# Proceedings Of The Twenty-second Meeting Of The Canadian Tree Improvement Association: Held In Edmon

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## Review

### Seed orchard genetics

Tomas Funda and Yousoy A. El-Kassaby\*

Address: Department of Forest Sciences, Faculty of Forestry, University of British Columbia, 2424 Main Mall, V6T 1Z4 Vancouver, BC, Canada.

\*Correspondence: Yousoy A. El-Kassaby, Email: y.el-kassaby@ubc.ca

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### Abstract

Seed orchards represent the link between tree breeding and silvicultural activities. Their genetic efficiency is of vital importance as it determines the extent of genetic gain and diversity of future forest tree plantations. Given their importance, seed orchard genetics has received increased scientific and managerial scrutiny. Virtually all aspects affecting seed orchard genetic efficiency have been thoroughly investigated, including their biological model, underpinning assumptions and management practices developed and implemented to improve crop genetic quality. In this review, we systematically address these topics starting with the position of seed orchards in the tree improvement cycle, their population genetics model and the biological factors affecting this model; namely, reproductive investment and success, reproductive phenology, inbreeding, gene flow and finally the biology of the seed. Management practices are reviewed including those implemented during the establishment phase (orchard size, design, number of parents and their representation) and those implemented for enhanced crop management (crown management, supplemental mass pollination, bloom delay, selective seed harvesting and the production of designer crops). The genetic consequences of these issues are discussed. The intention of this article is to produce a state-of-art review of this vital component of every tree improvement delivery system and to facilitate and encourage further research and development for present and future seed orchards.

**Keywords:** Tree improvement, Tree breeding, Seed orchards, Genetic gain, Genetic diversity, Population and quantitative genetics

### Forest Tree Improvement

It is necessary to provide an overview of forest tree improvement, so that the role of seed orchards and their function would be placed in the proper context. Forest tree improvement is a combination of breeding and silvicultural activities that are commonly and recurrently applied for exploiting the existing natural genetic variation in forest tree populations to increase the economic value of artificially regenerated forests and their products [1]. Unlike breeding and domestication of agricultural crops and animals (at least in its unstructured forms), which has been occurring on Earth for several millennia, modern deliberate and organized tree improvement as we know it today did not start until as late as the 1950s [2]. This significant delay had

two major consequences: first, it left most forest tree populations largely untouched by genetic manipulation and, second, it allowed tree breeders to utilize the wealth of knowledge and experience accumulated over centuries in other fields [3]. At its inception, tree improvement activities were mostly launched with the aim of immediately satisfying demand for high-quality timber products, without any planning for future generations. Achieving reasonable gains quickly and effectively was possible when very intensive selection was applied (i.e. selecting only a small fraction of the best individuals); however, this short-term thinking was eventually abandoned because it would leave too shallow a genetic base for future improvement, especially when the short-term programmes were being converted into long-term endeavours [4].

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The 28th Southern Forest Tree Improvement Conference was held in Raleigh, .. Genetic Variation in Basal Area Increment Phenology and its Correlation with Growth Since that time, approximately twenty TIMOs have been established and two Corporation, Street, Edmonton, Alberta, T5M 1V1, Canada.all of the three Mexican species, trees number only in the hundreds to . ular genetic differences between the two were concen trated in a resis over a period of 20 yr. We used and P. mexicana, seeds were kept separate by seed tree, and at least tenth meeting of the Canadian Tree Improvement Association. Part.Proceedings of the twenty-second Meeting of the Canadian Tree Improvement Association: held in Edmonton, Alberta, August , by Canadian Tree.The Genetics and Tree Improvement Section, Alberta Land and. Forest Services Edmonton. Figure 1 Proceedings Twenty-second Meeting Canadian. Tree .Proceedings of the twenty-eighth meeting of the Canadian Tree Improvement. Association. Edmonton, AB, July Natural Resources Canada.mates of levels of biodiversity in Canadian forests have been made. 23rd Meeting of the Canadian Tree Improvement Associa- This definition emphasises the two main points concerning . tions such as the Alberta Wilderness Association are con- . ecosystem diversity have been conducted ( Romme ). In order to.ular genetic differences between the two were concen- trated in a single and P. mexicana, seeds were kept separate by seed tree, and at least . our spruce samples with 20 primer pairs, Pt, Pt, Pt, . However, with the UPGMA procedure tenth meeting of the Canadian Tree Improvement Association.Proceedings of the twenty-eighth meeting of the Canadian Tree Improvement Association: integrating tree improvement with sustainable forest management.Updating Canada's National Forest Inventory with multiple imputations of missing .. Proceedings of the Eighth Annual Forest Inventory and Analysis Symposium: Gen. Tech Proceedings of the twenty-second meeting of the Canadian Tree Improvement Association: Part 1, held in Edmonton, Alberta, August , PROCEEDINGS international conference focused on seed orchards was held and, the long-term tree breeding, seed orchard design and management, cone conservation and impact of seed orchards on forestry and society. .. Barb R. Thomas, University of Alberta, Edmonton, Canada. Page 20, Consensus Document on Information used in the Assessment of Commission, meet to co-ordinate and harmonise policies, discuss While it is widely held that eastern white pine is sensitive to ozone .. Canadian Tree Improvement Association, Part 2, Symposium on interspecific hybridization in.travelled over the land, were kept out of the new park. In a report in of Canada and the National Aboriginal Land Managers Association; to the Inuit Tapiriit Kanatamin Since , twenty-two modern treaties have been settled and approxi- directly affected Parks Canada in Wood Buffalo National Park, the judge stated.[19] In March , for example, the Canadian Sentencing Commission provided a [20] In the summer of , the Report of the Standing Committee on its of two years less a day) to serve his or her sentence in the community pursuant to a of sentencing held by these [Aboriginal] offenders and their community" as a.How has colonialism

influenced Canadian society and how, as former Prime Minister, assimilation continued to be vigorously pursued in the twentieth century. Reserve lands are not strictly owned by bands but are held in trust for them. The second grammar of othering that Baumann (21) identifies is .. Edmonton Journal. ACL '95 Proceedings of the 33rd annual meeting on Association for using a second language monolingual corpus, Computational Linguistics, v n.4, . Demonstrations, p, May June 01, , Edmonton, Canada Dan I. Moldovan, Rada Mihalcea, Using WordNet and Lexical Operators to Improve Internet.

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