

Silver birch breeding and seed production to increase sustainability of future forests

Historically, forests and forestry in Sweden have been based on active management of Norway spruce and Scots pine in monocultures. In the last decades, a plethora of abiotic and biotic damage have been negatively affecting forest stands in the whole of Sweden leading to dramatic economical and ecological consequences.

This simplified management based on coniferous species cannot be continued. There is a need to create robust forests that will withstand a changing climate and that will give more opportunities for development of new products in a growing bioeconomy. Including more broadleaves tree species in regeneration and management to diversify stand composition and structure is the most obvious and natural approach to adopt. Planting more silver birch from genetically improved sources is the solution that is already available and can be implemented on a much larger scale than currently.

In my talk, I will present birch as a very valuable species for regeneration that should be used more frequently in forestry to secure the forest sector's needs and its sustainability goals in the next coming decades. I will use a conventional breeding program as a frame and connect it with implementation to practice and challenges concerning seed production in seed-orchards. Currently, there is a growing interest in increasing birch in forestry but the demand for seedlings cannot be met by seed production in existing greenhouse seed orchards. It takes time to establish new ones, and treatments that can boost flowering, such as prolonged day length exposure, are measures that could be immediately implemented to increase seed production.

The development of molecular biology techniques in the last three decades has opened possibilities for implementation of genomic selection for rapid improvement of birch. DNA based models are likely to be highly predictive and give good selection precision. Flowering of young material selected in genomic selection is the main bottleneck for its implementation. I will share the amazing results and experience from a flowering study with one-year-old birch plants that are likely to open possibilities for implementation of genomic selection and "speed breeding".

By implementing more effective and quicker breeding of birch, I hope to contribute to the creation of resilient, productive, and diverse forests that can meet the demands of a changing climate, support a thriving bioeconomy, and secure the sustainability of forestry in Sweden for generations to come.