***Lēmumu pieņemšanas atbalsta instruments meža ražības paaugstināšanai, nodrošinot efektīvu un klimatam piemērotu selekcijas efekta pārnesi***
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***Pētījuma rezultāti prezentēti starptautiskā zinātniskā konferencē***

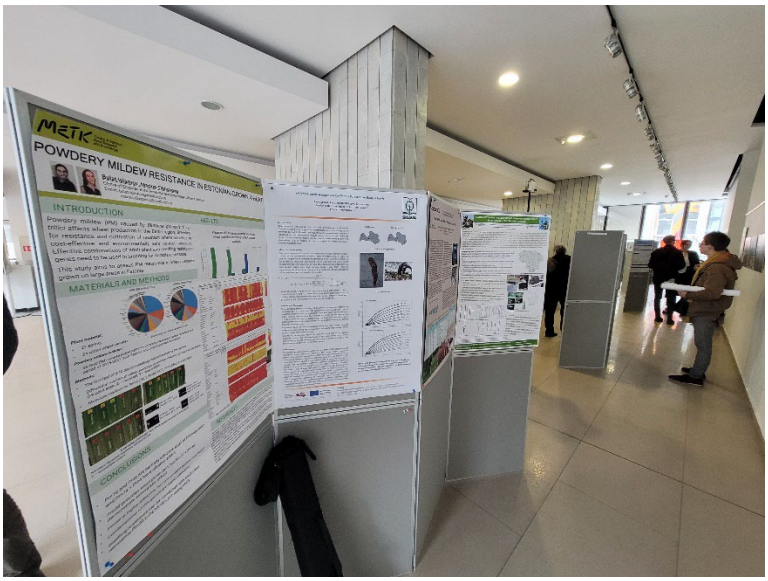
Pētījuma rezultāti prezentēti starptautiskā zinātniskā konferencē "VIII Baltic Genetics Congress", Kaunas, Lithuania, March 21-24, 2023.

Konferencē iesaistīti dalībnieki no visām trim Baltijas valstīm Latvijas (g.k. akadēmiskais sektors – institūti, universitātes, bet arī pētniecību un inovācijām saistītie uzņēmumi). Darba sesijas organizētas kā mutisko un stenda referātu daļas. Stenda referāti apskatāmi visiem dalībniekiem arī pārtraukumos.

Pētījuma ietvaros trupināts attīstīt augšanas gaitas vienādojumus, ar mērķi precīzāk raksturot selekcionētā (dažādās meža reproduktīvā materiāla kategorijās ietilpstoša) materiāla (skuju koku)

ikgadējā pieauguma dinamiku. Iegūtie rezultāti rekomendēt izmantošanai mežsaimniecības praksē.

Stenda ziņojums (pievienots relīzes pielikumā): Zeltiņš P., Rieksts-Riekstiņš R., Jansons Ā. Height Growth of Improved Coniferous Forest: Case Study in Latvia.



# *Height Growth of Improved Coniferous Forest: Case Study in Latvia*

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## Introduction

Bioeconomy is and will be the backbone of economies in Northern Europe. Assisted gene migration, incorporated in tree breeding, is an essential part of it. Altered stand dynamics of improved trees should be identified and incorporated in growth models to accurately reflect its results. Such advanced models can be used for assessment of different alternatives, e.g. in relation to best strategies for increased climate change mitigation effect.

## Materials and Methods

Our study assessed forms of the King-Prodan height growth function based on the remeasured National Forest Inventory plots in Latvia to predict the growth of unimproved coniferous trees. Growth of improved (in categories 'qualified' and 'tested') trees were assessed using height measurements from progenies of more than 350 open-pollinated families per species (Scots pine and Norway spruce). Data from repeated measurements of the same trial as well as height-growth reconstructions of sample trees were included in the model.

$$H_2 = 1.3 + \frac{A_2^{g_3 \cdot b_3}}{g_2 \cdot b_2 + g_3 \cdot 100\, b_3 \frac{\frac{A_1^{b_3}}{H_1 - 1.3} - b_2}{100 b_3 + A_1^{b_3}} + \frac{\frac{A_1^{b_3}}{H_1 - 1.3} - b_2}{100 b_3 + A_1^{b_3}} A_2^{g_3 \cdot b_3}},$$

where $H_1$ and $H_2$ - height at the beginning and end of the forecast period, respectively m; $A_1$ and $A_2$ - breast height age at the beginning and end of the forecast period, respectively, years; $b_1$; $b_2$; $b_3$ - empirical coefficients; $g_1$, $g_2$ and $g_3$ are FRM category-specific genetic multipliers.

## Results and Discussion

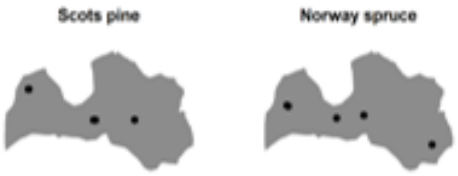
The estimated genetic multipliers of the growth function were statistically significant ($p < 0.01$) for both FRM categories of all three species. Overall, modified models fitted the calibration data with high accuracy ($R^2adj \geq 0.92$), Norway spruce having the smallest errors. We did not observe any trends in residuals over predicted height for Scots pine, but there was a slight overestimation for higher trees and an underestimation for smaller trees for Norway spruce

Improved trees of both evaluated categories had steeper growth trajectories at a young age compared to an natural regeneration (mean growth on un-improved material).

Growth of the category 'tested' for pine exceeded that of the category 'qualified' across the modelled age range, while trajectories mainly overlapped for spruce on the lower site indices (representing only 20% of the current area occupied by this tree species).

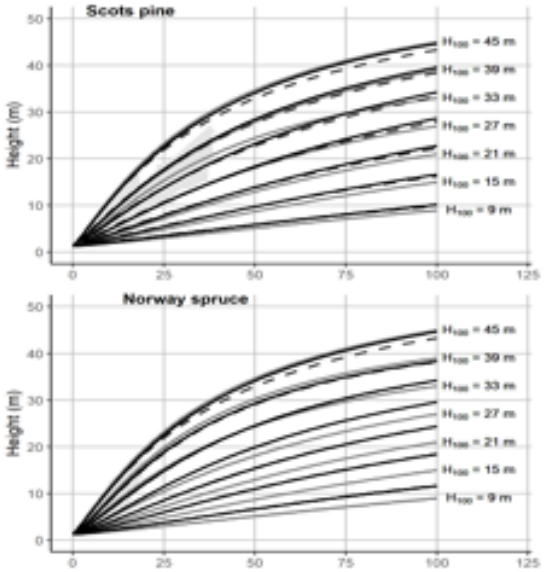
## Conclusions

The tested growth functions with the best-fitted FRM category-specific multipliers more accurately reflected the actual height growth of genetically improved Scots pine and Norway spruce in comparison to the unmodified reference function calibrated solely on data from NFI. The modelling results indicate a faster growth rate of improved material at a younger age, suggesting a potentially altered management regime for young stands. A set of multipliers for each FRM category – 'tested' or 'qualified' – may be easy applicable in practice from the perspective of forest owners and managers, who usually have the necessary information about the origin of planting material used in forest regeneration. The advanced models for improved trees indicate the potential to schedule such management activities as thinnings more promptly, without eventual delay due to underestimation of growth. However, such predictions are limited to sites with medium and high site indices, where improved planting stock is typically used.




Location of analyzed trials

Data collection




**Models with genetic multipliers (black solid and dashed lines for improved categories 'tested' and 'qualified', respectively) vs. unmodified model (dark grey solid lines) for Scots pine and Norway spruce in different site indexes**

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