Cover letter

Title of the manuscript: Genetic variability and juvenile–adult correlations of Norway spruce (Picea abies L. Karsten) provenances, tested in multisite comparative trials

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Description of the paper: The aim of our study was to analyze the stability traits between 33 Norway spruce provenances tested in five field trials across different environmental conditions, in two major variants of the Romanian Carpathians: outside of the natural distribution range (ONR) and in the natural habitat (INR). To justify the early selection, we selected 40-year-old trees and measured tree height (Th), breast height diameter, pruning height, crown diameter, tree volume, tree slenderness (Ts), pruning height ratio, and crown slenderness, which were then compared on a time series with measurements from trees at 30 and 10 years old, respectively. All provenances reacted to the changes in the environmental conditions, presenting higher Th in the warmer ONR environments, compared with the results of the mountain INR trials, with negative consequences on the stand’s stability. In all trials, highly significant differences resulted between,
and especially within provenances, suggesting a high potential for adaptation in the future climate change scenario. An analysis of the stability traits suggests that we must avoid ONR afforestation with Norway spruce. All the elite provenances (Marginea, Gurghiu, Comandău, and Sudrigiu), together with Câmpeni and Turda, were highlighted, both for the stability and growth traits, whereas the local provenances and the standard IUFRO provenance were ranked below the average of the trials. The age-age significant correlations and the ranking of the provenances show that no major changes occurred in the last ten years, confirming the backward selection performed at the age of 30 years. The juvenile–mature correlations were also strong but the different evolutions in time of the provenances eliminate the possibility of a juvenile selection. The forward selection strategy, for the best trees belonging to the six mentioned provenances, according to Ts, can be applied in the INR trials.

**Importance of the paper:** the most interesting findings to a general reader are:

(a) when moving to warmer environments the trees’ slenderness becomes too high, putting the stands at high risk of damage;

(b) there is little difference in the selected best provenances at 40 years vs. 30 years, so the backward selection at 30 years is recommended;

(c) despite a high juvenile-mature correlations, the absolute ranking of provenances changes substantially, so juvenile selection is not recommended.

**Data policy:** not the case.

**Declaration of the authors**

The authors declare that there is no conflict of interest regarding the publishing of the paper by the *Annals of Forest Research*, that the paper has been not published elsewhere, and not include any form of plagiarism. All the authors mentioned above have approved the manuscript and have agreed with the submission of the manuscript.

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to the journal Annals of Forest Research.

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