Aurore FANAL, Grégory MAHY & Arnaud MONTY
Liège University, Gembloux Agro-Bio Tech, Biodiversity and Landscape, Belgium

NEOBIOTA 2022 TARTU – 12TH INTERNATIONAL CONFERENCE ON BIOLOGICAL INVASIONS

Performance traits are positively correlated with global invasiveness of exotic trees : two case studies on maples and conifers.

Why?

- Determining what traits are correlated with invasiveness in order to **identify potentially invasive species**.
- In trees, an important **relative growth rate (RGR)** and **specific leaf area (SLA)** of seedlings under optimal growth conditions may be performance traits allowing exotic species to become invasive.
- We used an **innovative continuous quantification of invasiveness** for maples (*Aceraceae*) and conifers (*Pinaceae* and *Cupressaceae*).

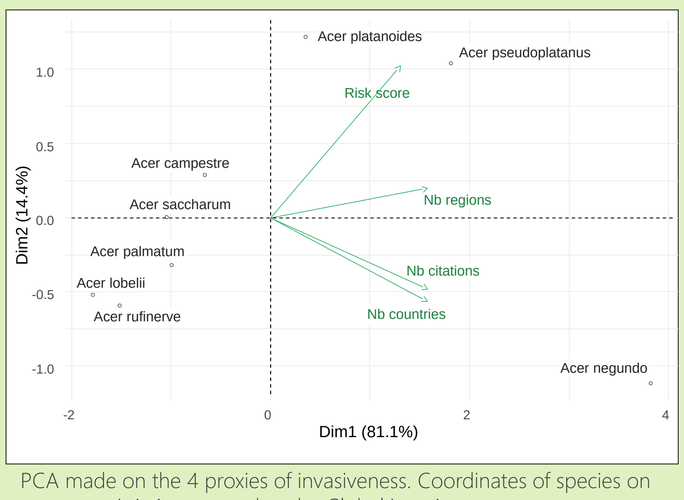
One hypothesis, two patterns

MAPLES

- ✓ Species' global invasiveness was positively correlated with RGR, SLA, number of leaves and height of seedlings after 8 weeks.
- ✓ **Fast growth** and **efficient light capture** at the seedling stage are strategies linked with enhanced invasiveness.
- ✓ **Performance-related traits can help predict which species are invasive, even for post-pioneer species invasive in shady forest ecosystems** such as maples.

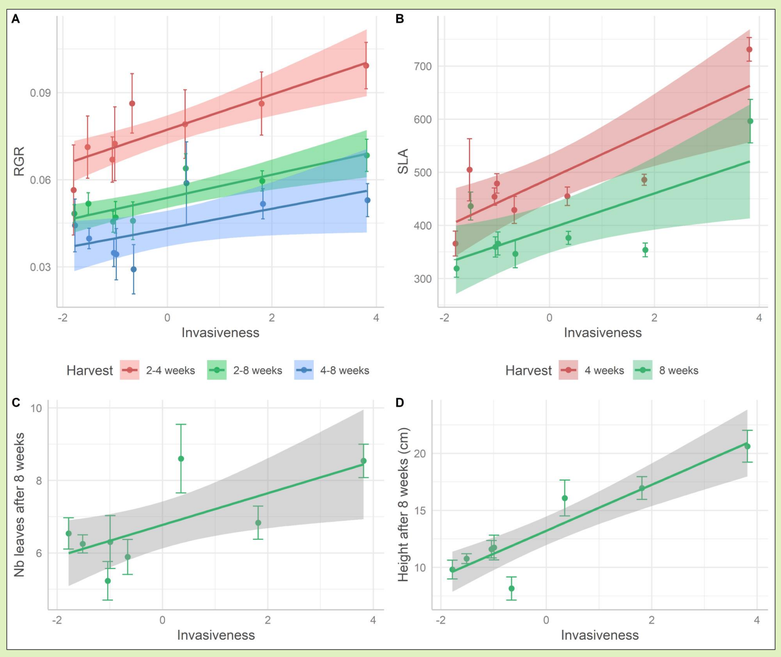
How ?

Eight maple species were grown indoor in 2019. Seedlings were harvested after 2, 4 or 8 weeks. At each harvest, SLA, height, number of leaves, RGR and shoot-root ratio were measured.



PCA made on the 4 proxies of invasiveness. Coordinates of species on Axis 1 were used as the Global Invasiveness score.

The **global invasiveness** was quantified using a combination (PCA) of the number of regions and countries invaded in the **GBIF** database, the number of citations as invasive in the **Global Compendium of Weeds** (GCW) and the risk score estimated in the GCW.



A positive significant relationship was found between global invasiveness and RGR, SLA, number of leaves and height of the seedlings after 8 weeks.

To be published soon in Plant Ecology !

Predicted values for functional traits with significant relationship to global invasiveness. Mean values and standard errors are represented for each species. Units are g.g-1.d-1 for RGR (A), $cm^2.g^{-1}$ for SLA (B).

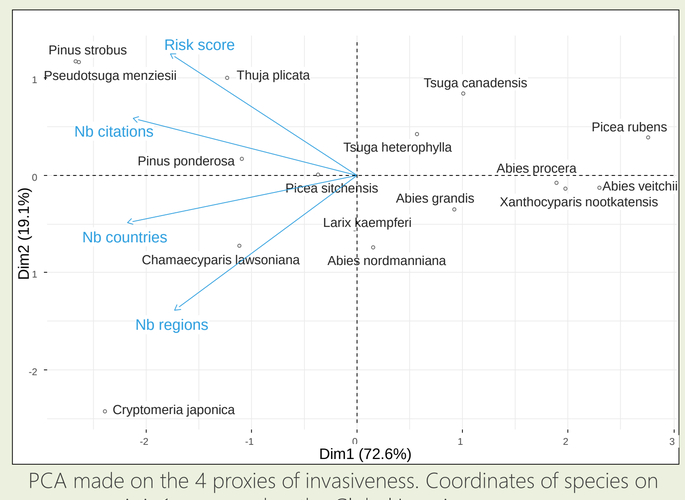
► An emerging invasive ? *Acer rufinerve*, an early-successional maple invasive in Belgium, displays trait values close to *A. negundo* and *A. pseudoplatanus* and should be monitored carefully.

CONIFERS

- ✓ Only the **height** of seedlings after 10 weeks was positively correlated with global invasiveness.
- ✓ No relationship was found between RGR and global or local invasiveness.
- ✓ The **combination of traits** promoting invasiveness might differ according to the type of invaded ecosystem. Conifer species invasive in closed forests still favor **vertical growth**.

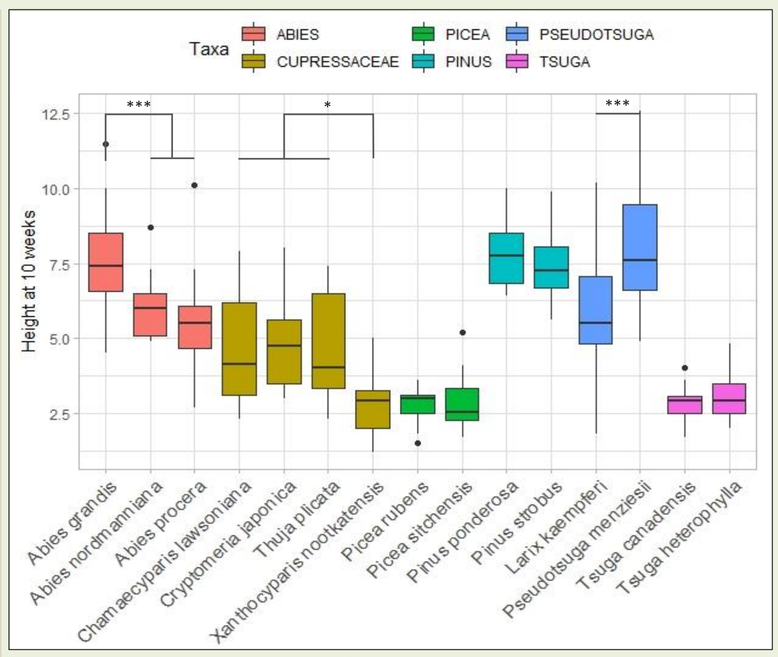
How ?

15 conifers were grown outdoor, under a shade sail, in 2021. Seedlings were harvested after 4 or 10 weeks. SLA, height, number of leaves and shoot-root ratio were measured for each harvest, as well as RGR between 4 and 10 weeks.



PCA made on the 4 proxies of invasiveness. Coordinates of species on Axis 1 were used as the Global Invasiveness score.

Local invasiveness in Belgian forests was also quantified as the density of regeneration and dispersal distance observed in old arboreta (Fanal et al. 2021)*. Height of seedlings, SLA and number of leaves were positively correlated to local invasiveness in Belgian forests.



Height at 10 weeks for the 15 conifer species studied. Species are grouped by phylogenetical closeness. Height was positively correlated to global invasiveness after phylogenetical control.

*Fanal A, Mahy G, Fayolle A, Monty A (2021) Arboreta reveal the invasive potential of several conifer species in the temperate forests of western Europe. NeoBiota 64: 23-42.

Take-home message

- ➢ **Once naturalized, maple species that become invasive present an acquisitive trait syndrome characterized by fast growth, rapid leaf production and efficient light capture via high SLA.**
- ➢ **For conifer species, only the height of seedlings was positively correlated to global invasiveness.**

Scan to see my work!

aurore.fanal@uliege.be