ABSTRACT EMPSEB23 2017

Getting better: which germination and juvenile traits are important for invasion in *Robinia pseudoacacia?*

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Biological invasions are recognized as a major threat for native plant communities and ecosystems. Yet, most of the biological invasion studies have been concentrating on ecological research. Indeed, adaptive evolution is often thought as a slow process and the role of evolution is still often overlooked. To date, a few studies documented fast evolutionary events leading to local adaptation in the invasive populations.

Robinia pseudoacacia (L.) was introduced to Europe from the USA at the beginning of the 17th century and is now considered one of the worst invasive species in Europe. In order to evaluate the mechanisms behind its invasiveness, both quantitative and population genetics studies are underway. Germination and early development phenotypic traits were evaluated in a controlled temperature experiment: 3000 seeds from 9 invasive populations in Europe from Spain to Poland and 11 native populations in the USA from all through native range was grown for up to 2-3 months. Seedlings were cultivated in three climatic chambers set at 18°C, 22°C and 31°C. Life history traits were monitored during the first 3 weeks following seeding, then morphometric and physiological traits were assessed twice.

Germination rate was much higher for seeds originating of the invasive range compared to native range in whatever the temperature (e.g. 85% vs 55% at 18°C), and for most populations within each range. Moreover, native populations originating from warmer areas performed better in the warmest environment; no similar effect was observed among invasive populations which had a very homogenous performance under all environments. This would indicate the existence of local adaption in the native range but not in the invasive range.

For early development phenotypic traits, no range effect (i.e. native vs invasive) was evidenced, however some populations were clearly differentiated. Moreover, families exhibited a strong

plasticity to temperature for all measured traits, the warmer environment being generally more suitable whatever their population of origin.

In addition, significant departure from neutral evolution was evidenced using a Q_{ST} - F_{ST} comparison for some traits in the invasive range, thus divergence among populations could have been achieved by directional selection on these traits in the invasive range.

In conclusion, germination success appears as a crucial element of differentiation between populations of *R. pseudoacacia* from the native and invasive range; however once germinated, seedlings performed in general in a similar way in response to temperature. The existence of highly differentiated populations makes it all the more important to evaluate the population genetics in a broad way over both the native and invasive ranges.