# Home teams hold the advantage

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MSU scientist shows that the home team holds the advantage over visitors -- at least in the plant world. Credit: MSU

The home team holds the advantage over visitors – at least in the plant world. However, a mere handful of genetic adaptations could even the playing field.

In the current issue of the *Proceedings for the National Academy of Sciences*, Michigan State University researchers and their collaborators found that plant adaptation to different environments involves tradeoffs in performance.

Genetic tradeoffs, in part, explain the rich diversity of species on earth. If all plants could perform well in all climates, the world would have similar flora from the poles to the Equator. Tradeoffs, however, such as protection from freezing temperatures in exchange for growing larger, must be made by plants, limiting the regions where they can flourish.

"A racecar driver in Monaco wouldn't choose the same tires as a postal worker in the Yukon," said Douglas Schemske, co-author and MSU plant biologist. "No single tire does well in all conditions, so drivers must choose the best tires for snow, rain, sand or racing; biological species reflect similar performance tradeoffs."

Schemske and Jon Agren (Uppsala University, Sweden) led the 5-year study that focused on *Arabidopsis* plant populations in Sweden and Italy. In direct competition, the home plants outperformed their visitors, which supported the notion that home populations are adapted to their local conditions.

Examining the genetic basis of plant performance revealed the locals' home-court secrets. Since Sweden has long, harsh winters, the Swedish plants had freezing tolerance as their major adaptive trait. The Italian plants, racing to beat hot, dry summers, devoted much of their energy to flowering in the spring ahead of the heat.

The long-held view the scientists dispelled, however, was that it takes many genes to fuel the adaptations that allow the plants to thrive in different climates.

"Even though the environments of Sweden and Italy are vastly different, we found that only 15 regions of the plant's genome are involved in adaptation," Schemske said. "The interdisciplinary and international effort it took to identify the ecological and genetic mechanisms of adaptive tradeoffs underscores the value of long-term experiments such as this."

The genetic mechanisms that allow these adaptations have relevance to understanding biodiversity, growing crops in varying climates and projecting the impacts of global change.

With that in mind, Schemske and his colleagues will focus future research on identifying the full spectrum of traits and genes required for adaptation.

Christopher Oakley, MSU postdoctoral researcher, and scientists from Colorado State University also contributed to the study.

**More information:** Genetic mapping of adaptation reveals fitness tradeoffs in Arabidopsis thaliana, www.pnas.org/cgi/doi/10.1073/pnas.1316773110

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