

## **Aiding the Red Queen: A hidden link in the mutualistic interaction between squirrels and pines**

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Positive correlations between levels of population genetic diversity and fitness traits are frequently observed, and have been implicated in host populations' ability to cope with parasite infections. We characterized patterns of genetic diversity and gastro-intestinal helminth fauna in the southern squirrel *Sciurus meridionalis*, a narrow endemic species mostly inhabiting pine forests (*Pinus laricio*) of southern Italy. Microsatellite and mitochondrial markers consistently showed negligible or null levels of diversity within populations. However, squirrels inspected for gastro-intestinal helminths (n=46) almost completely lacked parasites (n=1, *Catenotaenia dentritica* [Caestoda]). The tight association of southern squirrel populations with *Pinus laricio* forests, and their massive consumption of pine cones as food source, suggested us that cone consumption might provide squirrels with the additional benefit of anthelmintic activity. We explored this hypothesis, by analysing phytocomplexes content from pine cone and isolated resin samples by means of gas-chromatography mass-spectrometry. A wide range of secondary metabolites, including sugars, flavonoids, phenols, and terpenoids, were obtained from both resin and, to a lesser extent, whole-cone samples. Some of them are well known for antioxidant, anti-inflammatory, and anthelmintic activity, and were found at high concentration. Our results provide preliminary support to the intriguing hypothesis that secondary metabolites produced by pine trees, might be a previously unrecognized component of the widespread mutualistic interaction between squirrels and pines. In addition, this component of the interaction might help explaining why - in spite of a shortage in standing genetic variation - southern squirrels have appeared so successful in their evolutionary arm race against helminthic parasites.