Fast growth, low defense -- plants facing a dilemma

January 28 2011

Plants are attacked by a multitude of insects and mammals. As defense against these herbivores they developed complex defense mechanisms over the course of evolution: spines, thorns, leaf hairs and a number of toxic chemical substances. For decades it has been controversially discussed whether the production of defense traits incurs costs to the plants.

Now, using a new method the ecologists and plant biologists of the University of Zürich together with their American colleagues demonstrate these costs accurately in a *Proceedings of the Royal Society* article.

For their study, the researchers planted different «knockout»-mutants of the same genotype of the model plant Arabidopsis thaliana. They then harvested a subset of these plants in evenly distributed intervals to measure the biomass growth over the whole plant life. «Mutants with suppressed defense mechanisms showed an increased growth rate» Tobias Züst explains the result of his study. But the faster growth comes at an added cost: aphids reproduce faster on these plants than on slow growing plants with intact defense mechanisms. This is a result of the fact that fast growing plants provide more resources to the herbivore than slow growing plants in the same amount of time.

The study shows that natural resistance is often not compatible with fast growth. This finding is of great importance for agricultural crops: These crops have been selected for high yield and as a consequence have very

low natural resistance to herbivores, consequentially requiring high input of insecticides.

More information: Tobias Züst, Bindu Joseph, Kentaro K. Shimizu, Daniel J. Kliebenstein and Lindsay A. Turnbull, Using knockout mutants to reveal the growth costs of defensive traits, in: *Proceedings of the Royal Society B*, 2011, Jan. 26, doi:10.1098/rspb.2010.2475

Provided by University of Zurich