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Comment on Schubert, Matoušek and Supp: Stability of pathogen-derived *Potato virus Y* resistance in potato under field conditions and some aspects of their ecological impact

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Modern methods of pest control have tended to rely on a single method, whether it be a pesticide or a gene coding for resistance embedded using modern biotechnology tools in the crop itself. An important advantage of integrated pest management (IPM) over reliance on a single tool is that the repeated application of the single method rapidly leads to pest resistance to the tool. Using a variety of methods reduces the likelihood that any single method will fail. For instance, in the case of *Bt* transgenic crops that express a toxin that kills lepidopterans, the use of multiple (stacked) genes is thought to minimize the likelihood that a single mutant pest will be able to overcome a number of different mechanisms of action simultaneously.

The importance of integrated control is an important policy conclusion that might be drawn from the paper by Schubert and colleagues. They present results from field experiments with transgenic potato clones resistant to *Potato virus Y* (PVY), and find that resistance to PVY can be overcome by some strains. Moreover, the strains infecting transgenic plants appeared to be more virulent than those affecting the non-transgenic plants. Finally, engineering potatoes for resistance to PVY alters their defences against other pests such as aphids. These results highlight two pitfalls with genetically engineered resistance against pests.

First, there may be potential problems associated with a single mode of control in that a fast reproducing virus can rapidly generate mutations that can overcome the defenses offered by the resistance gene. This can be addressed either by embedding multiple genes for resistance against viruses in the potato or by combining biotechnology with other methods of pest management to reduce the selection pressure placed on viruses.

Second, methods of pest control may have unintended ecological side-effects, which in turn have economic consequences. In the Schubert study, an example of such a side-effect is the occupation of the ecological niche of a less virulent strain of virus by a potentially more dangerous strain. Excessive use of control could lead to the development of a more virulent strain that may be harder to control. Tolerating less virulent strains as a relatively lesser evil may be a wise alternative.

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