

# Breeding wildness back into our fruit and veg

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Wild tomatoes are better able to protect themselves against the destructive whitefly than our modern, commercial varieties, new research has shown.

The study, published today in the academic journal *Agronomy for Sustainable Development*, shows that in our quest for larger redder, longer-lasting tomatoes we have inadvertently bred out key characteristics that help the plant defend itself against predators.

## Dual mode of resistance in wild tomatoes

Led by Newcastle University, UK, the research shows that wild tomatoes have a dual line of defence against these voracious pests; an initial mechanism which discourages the whitefly from settling on the plant in the first place and a second line of defence which happens inside the plant where a chemical reaction causes the plant sap to "gum up" blocking the whitefly's feeding tube.

Thomas McDaniel, the PhD student who led the research, says the findings highlight the natural resistance of wild plant varieties and suggests we need to "breed some of that wildness back in" instead of continuously looking for new methods of pest control. "By selecting for certain characteristics we have inadvertently lost some really useful ones," explains McDaniel, who is based in the School of Biology at Newcastle University.

"The tomatoes we buy in the supermarket may have a long shelf life and

be twice as big as the wild varieties but the trade-off is an intensive and costly pest control regime—both biological and in the form of chemical pesticides.

"Our research suggests that if we can breed the whitefly resistant genes back into our commercial varieties then we can produce a super tomato that not only has all the characteristics that we have selected for but is also naturally resistant to the whitefly."

## **Neonicotinoids currently used to control whitefly numbers**

*Trialeurodes vaporariorum*, or glasshouse whitefly, is the foremost pest for the UK's tomato growers.

The pest damages the plant in three ways; by extracting sap and therefore vital nutrients, by creating a sticky 'honeydew' on the surface of the plant which attracts mould, and by transmitting damaging plant viruses through their saliva.

Currently, biocontrol methods are used to reduce the impact of the whitefly on tomato crops. The parasitoid wasp lays its eggs in the young whitefly which are then eaten by the hatching larvae. However, for control to be effective, the wasps need to be released on a weekly basis which is costly and labour intensive.

As a result, most farmers also use [chemical pesticides](#) as a second line of defence. This includes the widespread use of the controversial neonicotinoid pesticides which have been linked to dwindling bee populations.

**Whitefly were 80% less likely to settle on the wild**

## variety

In the study, funded by the Biotechnology and Biological Sciences Research Council (BBSRC), the team found that when given free choice, the whitefly were 80% more likely to settle and feed on the commercial tomato [plants](#)—in this case *Solanum lycopersicum* or 'Elegance'—over the wild variety - *Lycopersicon pimpinellifolium*.

By fitting gold wires to the back of individual whitefly and measuring the electro-chemical signals as they fed on the plant sap, the team found the insects spent more time 'roaming' and less time feeding on the wild varieties than those which settled on the commercial plants.

"One option would be to revert back to growing more of the older, wild varieties, and certainly we are already seeing a trend towards this, particularly on allotments and among smaller growers," explains McDaniel.

"However, lower yields means the wild varieties are unlikely to be a viable option on a large scale.

"Our findings suggest that if we can breed the wild, whitefly resistant genes back into our tomatoes—either through a selective breeding programme or genetic engineering—then it offers a real solution for the commercial tomato industry."

Project supervisor Dr Barry Brogan, also from Newcastle University, said the findings also highlighted the importance of maintaining biodiversity.

"There has been growing interest in traditional and wild varieties of fruit and veg, driven mainly by people wanting to re-capture the tastes of their childhood," explains Dr Brogan.

"But actually it's playing a vital role in protecting these older varieties and maintaining biodiversity. If we allow our wild species to be lost then we risk losing potentially useful traits that we might need at a later date."

**More information:** Novel resistance mechanisms of a wild tomato against the glasshouse whitefly. Thomas McDaniel, Colin Tosh, Angharad Gatehouse, David George, Michelle Robson and Barry Brogan. *Agronomy for Sustainable Development*

Provided by Newcastle University

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