Prospects for reducing crop losses to plant disease

Jonathan D G Jones

Plant disease results in reduced crop yield. Crop plants can be attacked at any phase of their life cycle; during seedling establishment, plant maturation, or grain or fruit setting. Pathogens and pests include nematodes, insects, fungi, bacteria, oomycetes and even parasitic plants. A multibillion dollar crop protection industry provides chemicals that reduce losses, but these chemicals (i) add to farmer costs (ii) require tractor trips that emit CO2 and cost fuel (iii) create a selection pressure that results in emergence of pathogen races that are resistant to the chemical.

Control of pathogens by resistance (R) genes in the crop plant is preferable to chemical control. I will discuss important crop diseases and how they may be more effectively controlled by R genes. It is clear that plant breeding has been effective in some crops for improving resistance, but it is also clear that GM methods, in combination with modern genomics methods, could greatly improve and accelerate the identification, recruitment and deployment of R genes to reduce crop losses. In particular, GM methods could accelerate the use of R genes from wild relatives of crop plants that are sexually incompatible with the crop, dramatically expanding the repertoire of R genes at our disposal.

World food production needs to increase. We no longer have the luxury of spurning GM methods because of purely hypothetical hazards. The Sainsbury Lab is committing its own resources to new methods that will accelerate isolation of R genes that can act against important crop diseases. However, this commitment may be in vain if the regulatory burdens for deploying GM crops are not reduced.