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John A. Pickett, Rothamsted Research, Harpenden, Hertfordshire, AL5 2JQ, U.K.
Email: john.pickett@rothamsted.ac.uk

Plenary Abstract

New approaches to sustainable intensification of global food production from agroecological interventions to new generations of GM crops for protection against pests and beyond.

Sustainable intensification of agriculture is now an absolute global priority. Sustainability literally requires no external seasonal inputs to agriculture which have to establish a new green revolution in order to deliver all inputs via seed traits and other planting material. Although, as yet, it is impossible to see exactly how this can be achieved for crop production, in crop protection we are already demonstrating opportunities in this direction.

Secondary plant metabolism has the potential to offer robust and sustainable plant protection and can represent similar effectiveness to current pesticides. However, in order to avoid strong selection for resistance, more sophisticated integrated pest management (IPM) strategies for deployment are required. Thus, when designing strategies to exploit secondary metabolism through breeding and GM, e.g. wheat expressing the aphid alarm pheromone, and by incorporating natural plant diversity to generate crop protection via companion planting, inducible expression is an essential component. Such induction agents or elicitors include patentable natural products from both aerial and rhizosphere interactions between damaged and intact plants. The push-pull technology, involving companion plants that are grown as intercrops to repel pests and attract natural enemies, and externally grown trap crops that attract pests, is working dramatically well in Africa. From this research and technology transfer programme, there are valuable lessons for developing and deploying GM crops in industrialised agriculture.

1. J Pickett *et al*. Delivering sustainable crop protection systems via the seed: exploiting natural constitutive and inducible defence pathways (2014). *Philosophical Transactions of the Royal Society B* **369**:20120281

2. J Pickett *et al*. Push-pull farming systems (2014). *Current Opinion in Biotechnology* **26**:125-132

3. Z Khan *et al*. Achieving food security for one million sub-Saharan African poor through push–pull innovation by 2020 (2014). *Philosophical Transactions of the Royal Society B* **369**:20120284

4. M.A. Birkett and J.A Pickett (2014) Prospects of genetic engineering for robust insect resistance. *Current Opinion in Plant Biology* **19**:59-67