O.02 - Biotechnologies: breeding for disease resistance as an integral component of crop protection

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As global climate change accelerates, reliable food production will become increasingly difficult. Challenges to agriculture will include not only variation in the severity of established diseases but also newly emerging pathogens. Disease-resistant plant varieties will continue to be vital components of an integrated strategy for crop protection.The success of plant breeding depends upon predictability, with varieties' performance in trials reflecting their likely future performance on farms. Breeding has therefore been especially important in controlling established diseases. It has been most successful where there has been genetic diversity in resistance, selection for resistance has been maintained and resistance has been combined with commercially important traits such as yield and quality. Cultivation of resistant varieties avoids excessive reliance on pesticides, reducing selection pressure for pathogen insensitivity to these valuable chemicals. Robust strategies for breeding disease-resistant, commercially successful varieties will be more vital than ever in a changing environment. In an important recent development, association genetics combines information about phenotypes, markers and pedigrees of many cultivars to enable simultaneous analysis of the genetics of several traits in diverse varieties. Its use will enable breeders to continue to produce commercially successful varieties resistant to the most important diseases. Breeding for resistance will continue to be one of several technologies for robust disease control. Within-crop genetic diversity will be useful in situations where stability of production is more important than maximising yield. GM technology will be needed to control some diseases, especially where breeding is ineffective or impossible and control by pesticides is inadequate. Pesticides will continue to be vital in food production, to 'top up' varietal resistance to control disease, to buffer against environmental variation and, perhaps increasingly, to allow time to develop varieties resistant to newly important diseases. I will use examples taken from fungal diseases of cereals, notably septoria tritici blotch of wheat, ramularia leaf spot of barley and powdery mildew of cereals.