

GCIRCBUL8*08

Brassica pathology

Resistance of oilseed rape to foliar pathogens

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There are currently no sources of resistance in cultivated brassicas to foliar infection by *Leptosphaeria maculans* and *Pyrenopeziza brassicae*, which cause Phoma leaf spot and light leaf spot disease, respectively. However, resistance to *L. maculans* has been located in wild relatives of the diploid progenitors of oilseed rape, *B. oleracea* and *B. rapa*. The wild relatives of *B. oleracea* comprise a complex of eleven perennial species which occur on limestone maritime cliffs of southern and eastern Europe while those of *B. rapa* are more ruderal in habit and have a wide distribution through Europe and Asia.

Synthetic lines of *B. napus* have been derived by crossing representatives of the *B. oleracea* complex with an inbred turnip rape line and then rescuing embryos from the developing ovaries prior to abortion. Haploid "*B. napus*" plants are derived from the embryos and following colchicine treatment these can be crossed to oilseed rape cultivars to introduce the resistance genes into rape breeding lines. A similar programme has been initiated with wild forms of *B. rapa*. In addition to disease resistance, a number of other characters of potential economic importance have been transferred into *B. napus* lines. A reduction in fertility is often observed with hybrids between synthetic and natural *B. napus* lines, but sufficient levels are retained to enable backcross generations to be obtained.

In addition to studying the genetic basis of resistance, research programmes have been initiated to study the physiological and biochemical interaction between fungal pathogens and *Brassica*. The role of leaf glucosinolates in resistance is being investigated and preliminary results suggest that the presence of certain glucosinolates in high concentration can reduce the rate of lesion development. Other studies, in collaboration with INRA, have studied the potential involvement of indole phytoalexins in resistance.

GCIRCBUL8*09

Interaction between Brassica species and Plasmodiophora brassicae

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Clubroot disease of *Brassica* continues to be of major economic importance on vegetable crops and on spring rape crops in northern Europe. Current methods of chemical control are now thought to be environmentally unsafe and hence there is considerable interest in greater exploitation of resistance genes. High levels of resistance is known to occur within some stubble turnip and fodder rape lines. These lines are being used as parents in a programme designed to develop fast-flowering homozygous lines of *B. napus* which will be used to study the relationship of the different resistance genes to each other and their mode of action.

Several aspects of the biology of *Plasmodiophora* infection of host tissue are not understood. An investigation has been made of the invasion of the fungus into root tissue of *Brassica* and *Arabidopsis*. To assist these studies, hairy root cultures have been developed from resistant and susceptible *Brassica* lines through infection with *Agrobacterium rhizogenes*. We have been able to infect these cultures with *Plasmodiophora* and are currently studying the action of resistance genes.