Cropping history and breakdown of the *Brassica napus Rlm1* resistance gene to *Leptosphaeria maculans* in France

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Leptosphaeria maculans, the cause of stem canker of oilseed rape develops gene-for-gene interactions with its host plant. On the basis of the analysis of 988 isolates of *L. maculans* collected between 1991 and 2000, the objective of the present study was to assess race structure of the fungus in France, with regards to the *AVR* gene *AvrLm1*, and to evaluate the effect of the selection pressure due to large-scale cropping of *Rlm1* cvs on the evolution of races of the fungus. The race *AvrLm1* always represented more than 90% of the populations, at all locations sampled in France, till the 1997-1998 growing season. This was consistent with the efficiency of the *Rlm1* cvs to control the disease and the subsequent commercial success of these cvs. that were grown on 43.7% of the total French acreage in oilseed rape in 1998-1999. However, the increased commercial success of *Rlm1* cvs was paralleled by a drastic decrease in the ratio of *AvrLm1* isolates within the French populations in two growing season only, 1997-1998 and 1998-1999. This resulted in less than 20% of *AvrLm1* isolates in the 1998-1999 growing season, and fully contributed to the loss of efficiency of the *Rlm1* resistance in the field. The present study is a perfect illustration of one round of a “boom and bust” cycle that occurred for a pathosystem where it has never been reported before. These data and the high evolutionary potential of *L. maculans*, are fully supportive of one pathogen species with a very high risk of breaking down resistance genes in oilseed rape, and suggest that the development of integrated strategies aiming at maximising the durability of novel resistance has now became a priority for this pathosystem.