

Insecticide resistant Peach-Potato aphids – Are they here to stay?

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Abstract

Following the discovery of aphicide resistance in north-eastern Scotland in 2000, numerous outbreaks of insecticide resistant Peach-Potato aphids (*Myzus persicae*) were recorded in eastern Scotland during the late summer of 2001. After the burning down of potato crops, resistant aphids moved onto emerging autumn sown oilseed rape crops, causing considerable damage. Following a mild

winter, there was no major resurgence of aphicide resistance in Scotland in either 2002 or 2003. However, *M. persicae* populations were unusually abundant in north-eastern Scotland in 2003 and it is possible that dominance of a particular genotype could have been responsible in this case.

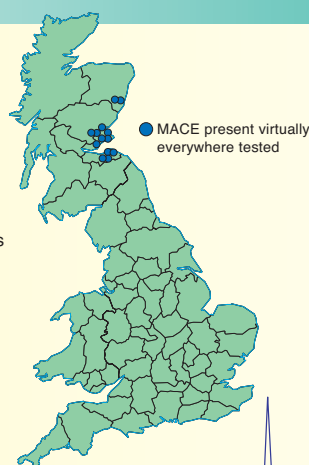


Protecting Seed Potatoes

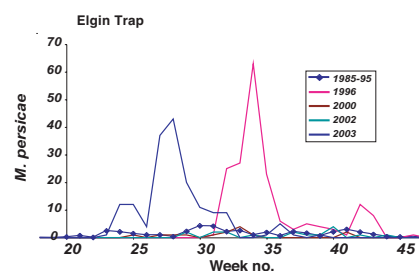
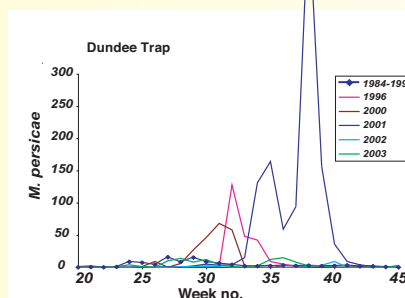
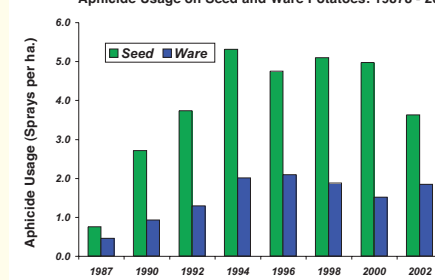
To protect the high health status of the Scottish seed potato industry a programme for monitoring field populations of potato aphids was introduced into the Seed Potato Classification Scheme (SPCS) in 1992. The programme is aimed at ensuring that uncontrolled aphid activity does not lead to unacceptable increases in virus incidence within the growing crop. Since 1987, aphicide usage on potato crops in Scotland has increased. There are three known resistance mechanisms in aphids. Aphids with elevated esterase enzyme levels are able to inactivate specific insecticides before they can reach the nervous system, and aphids with knockdown resistance (kdr) and modified acetylcholinesterase resistance (MACE) have modified proteins which are insensitive to the actions of specific insecticides.

With relatively few clones of *M. persicae* present in Scotland (e.g. the braveheart clone see below), environmental factors that confer a selective advantage on a specific genotype have the potential to significantly effect the population biology of this species. In recent years unusual activity of *M. persicae* has been detected in Scottish aphid suction traps.

At Dundee, high numbers of *M. persicae* were detected in 1996, 2000 and 2001. Since 2001, populations have been similar to the 1984–1995 average. The exceptionally high peak in 2001 was associated with a high incidence of MACE resistant *M. persicae* and numerous outbreaks of insecticide resistant aphids in fields in eastern Scotland.



Aphicide Usage on Seed and Ware Potatoes: 19878 - 2002

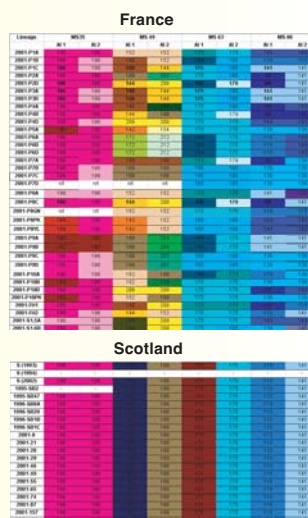
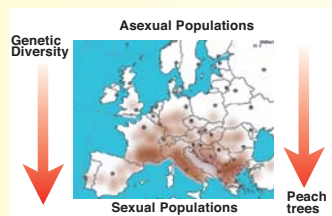


At Elgin, high numbers of *M. persicae* were detected in 1996 and 2003. Unfortunately, the trap was not in operation in 2001.

Microsatellite fingerprinting

Each microsatellite allele is a different size. There can be over 20 alleles at any one locus. In this Table there are four microsatellite loci (coloured pink, yellow, light and dark blue). Microsatellite size alleles are a different shade. There are two columns for the two homologues. A heterozygote will have two length alleles whereas a homozygote will have one. Each row gives the genotype of a different culture. There are examples where different cultures are the same genotype (clones) and some which were found only once.

This work has shown that genetic diversity in *M. persicae* is much greater in France than in Scotland. This can be explained by the association of its sexual cycle with peach trees and therefore most of our French aphids are recent products of meiosis. In contrast, the sexual cycle cannot be completed in Scotland and any attempt to do so would be a disadvantage. As a result there are only a few well adapted genotypes in Scotland such as braveheart.



Braveheart Clone

We have determined that the braveheart clone is widespread as it is found in locations at least 400km apart. It is also found from year to year and the figure below illustrates the prevalence over an eight year period. In 2001 large numbers of highly resistant *M. persicae* were found on crops. However, this has made no impact on the numbers of braveheart collected this year.

MACE/knock-down resistant/Esterase R3 genotypes arrived in Scotland in 2000

