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Variation in the abundance of *Rhopalosiphum padi* in Finland

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The bird cherry–oat aphid, *Rhopalosiphum padi* (L.), is the major aphid pest in spring cereals in Finland. It is also the vector of *Barley yellow dwarf virus* (BYDV) which is the most serious virus disease of cereals. The epidemics of BYDV have clearly been connected with outbreaks of *R. padi*. Generally, outbreaks of aphids appear periodically, every 3-7 years, but are very irregular. BYDV problems have occurred in the whole cropping area of spring cereals, mainly in oats and barley.

In Finland, *R. padi* is holocyclic and requires to host-alternate. It overwinters as a winter egg on the primary woody host, *Prunus padus* L. The mortality rate of winter eggs ranges between 10 and 45 % depending on the region. In the spring and early summer, new migrants colonise spring cereal crops. During the late summer, perennial grasslands are the main habitats of *R. padi*, before their migration back to the primary host.

Changes in cultivation practices and climate change may affect the risk of *R. padi* and BYDV. During the last decades, the proportion of the cropping area sown to spring cereals has increased and was over 50% of the arable area in 2008. At the same time, the percentage of winter cereals has been low, and the proportion of grassland has decreased, especially in southern Finland. New cultivation practices, such as direct drilling and no-tillage, have become very popular in cereal production. All these changes may affect the survival of *R. padi* and change the epidemiology of BYDV. Weather conditions above all affect both the population biology of vectors and the growth of host plants. The synchronisation of aphid phenology with the susceptible growth stage of the host plant is important for virus epidemiology and its spread.

The Finnish forecast of *R. padi* is based on egg counts on the winter host. The winter egg count in *P. padus* gives an estimate of the abundance of overwintering native aphids and takes regional risk differences into consideration. However, the long term migration of aphids by southern winds is also a recurrent but unpredictable phenomenon. The numbers of migrating aphids in spring and autumn are monitored with a suction trap at three locations in Finland. Furthermore, the numbers of *R. padi* attacking cereal crops are observed with yellow sticky traps in the field experiment plots and commercial farms.

In Finland, the most severe outbreak of *R. padi* was in 1988. After that, the numbers of *R. padi* have been above the threshold for chemical control in 1992, 1999 and 2002. In these years, winter egg counts also forecasted high aphid risk although this varied with region. However, in some years local risks based on winter egg counts have not been realised because of unfavourable weather conditions in spring and early summer. Early arrival in fields is often correlated with the later abundance of aphids and severity of damage, because the risk is greatest during the seedling stage of spring cereals.

The effects of no-tillage on aphid abundance have been variable. According to yellow sticky trap data over several years, more alate aphids have been detected, almost without exception, in ploughed rather than in no-tillage plots although the threshold for chemical control has not been exceeded. In 2002, numbers of aphids on tillers were counted in two tillage experiments and significantly more plants infested by aphids were found in ploughed than in no-tillage plots in both experiments. This can result from the 'repellent effect of stubble' in which stubble ground can decrease landing rates of aphids among crops compared to bare tilled soil.

Temporal and spatial variation in the abundance and importance of pest insects is typical in arable cropping in Finland. Because aphid problems are occasional but may cause locally severe damages, long-term and short-term forecasting and warning systems are important and field monitoring is necessary for effective control.

Key words: aphids, insect pests, plant protection, cereals, no-tillage