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A warning system for cereal aphids

Population growth of cereal aphids may be extremely rapid. Our most important species **Sitobion avenae** and **Metopolophium dirhodum** show multiplication rates of nearly 200 times within a month. This is caused by rapid reproduction, short generation time and immigration. Prediction of population growth and peak numbers is therefore difficult and requires reliable data on immigration and population densities in early crop stages like booting.

Population growth models developed by Rabbinge, Ankersmit and Pak, 1979 were used for prognosis of aphid population development to warn farmers, field by field, in a crop protection system in winter wheat, EPIPRE. Besides population growth the system takes damage effects into account. The damage threshold is however not constant as it is lower when the farmer has to spray against diseases. In that case an aphicide-fungicide mixture can be applied cheaply just prior to flowering for a combined ear disease and aphid control. These treatments have however a very variable effect on aphid population development and may even increase the number of sprays necessary to achieve control. To prevent unnecessary spraying reliable population estimates at flowering are also urgently needed.

A simple, cheap and reliable population estimation method was therefore developed.

A statistically significant correlation was found between the probit value of the number of infested tillers and the logarithm of the number of aphids per tiller ($r = 0.92$, $n = 244$). The same relation holds when only ears are considered ($r = 0.93$, $\beta = 1.54$, $n = 225$), so that the average number of aphids per tiller or per ear may be determined in an easy way. Counts can be restricted to the determination of the number of infested tillers (when **M. dirhodum** and **S. avenae** are present or only **S. avenae** is seen) per 100 tillers. When, during flowering this percentage is higher than 30 the farmers are advised to spray. When it is below 30 no spray is needed for at least the next 2 weeks. However, in all cases be it with or without spraying at flowering, observations should be repeated weekly. When infestation levels at late watery ripe or early milky ripe exceed 70% spraying is advised. At infestation levels above 50% it is in fact better to use the percentage tillers (ears) with more than 10 aphids because, at higher densities, the correlation between number per tiller and number of infested tillers is lower. When this percentage of tillers (ears) with more than 10 aphids at watery ripe or early milky ripe is higher than 40, farmers are advised to spray.

Samples are taken by crossing the field diagonally and examining 5 tillers, 20 times. The results are noted on a preprinted sheet.

Damage levels are based on the rather weak (0.69) correlation between average aphid peak density per tiller and yield loss. The break-point between yield loss and cost of treatment is reached with 350 kg wheat loss. The cause of this low correlation lies with the nature of the aphid damage (Rabbinge and Vereijken, in press). Therefore further studies on the effects on yield of the two aphid species are needed to determine the number of aphids in the course of time that may cause economic damage.

RABBINGE, R., ANKERSMIT, G. W., and PAK, G., 1979. Epidemiology and simulation of population development of Sitobion avenae in winter wheat. Neth. J. Pl. Path. 85: 197—220.

RABBINGE, R., and VEREIJKEN, P. H. The effect of diseases upon the host. Proc. 3rd Int. Congr. Pl. Path. Munich, 1978.