ROLE OF DIMBOA IN THE PARTIAL RESISTANCE OF WINTER WHEAT TO THE GRAIN APHID (*SITOBION AVENAE* F.)

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INTRODUCTION

The grain aphid (*Sitobion avenae* F.) is an important pest of winter wheat crops in temperate countries (1). Aphids feed by sucking plant sap, which directly results in plant damage due to a reduction in the resources of the plant. Additional plant damage can also result from plant viruses transmitted by some aphid species and the grain aphid is vector of barley yellow dwarf virus (2).

Explosive increases in aphid populations can occur, but a number of factors operate to control them (3). Under favourable conditions, biological control of aphids by insect predators or parasites can have a decisive effect on aphid population levels. However, under normal conditions predator population growth lag somewhat behind host population growth and control is seldom complete. Therefore, it is necessary to use chemical control in some cases to avoid too large yield reductions.

The rising costs of pesticides, the increasing resistance of insects to them and their undesirable effects on the environment, has led to a renewed effort to describe and to exploit host plant resistance to pests and diseases. Cereals, while constituting the main food crops in the world have imperfectly described chemical defences.

The presence of secondary metabolites in plants may be of importance in protecting them against herbivores. Hydroxamic acids (Hx) constitute a well-documented chemical mechanism of resistance in cereals against aphids (4, 5).

Partial host-plant resistance could make a substantial contribution to reducing the damaging effects of cereal aphids and therefore to reducing insecticide use.

MATERIAL AND METHODS

Artificial diet is produced following the method described in (6). Just before it has to be used different concentrations of MBOA were mixed into the diet. MBOA is used in this study, because DIMBOA very fast and easily will break down to MBOA inside the living plant.

The artificial diet is placed between two membranes of Parafilm™. The Parafilm sacket is placed on the top of a little plastic container and closed at the bottom with a cork. Newborn individuals of *Sitobion avenae* were collected from colonies maintained on winter wheat cv. 'Herzog' grown under light/dark 16/8 hours in mini-glasshouse at 20°C. A newborn aphid is placed inside the container at the lower side of the sacket.

For the next 4 weeks the intrinsic rate of increase (r_m) is calculated from the common population development equation: $N_T = N_0 e^{rm T}$; N_T is number of aphids to the time T, and N_0 number of aphids to the time 0. Time is calculated as day degrees (DD) with a basic development temperature at 3°C. The unit for r_m is number of aphid per aphid per DD.

For the statistical analysis is used PROC GLM in SAS (7).

RESULTS AND DISCUSSION

In table 1 result from the test of *Sitobion avenae* on different concentrations of MBOA is shown. As will appear an increasing concentration of MBOA results in a decreasing r_m – value. With concentrations from about 0.5 mMol and higher no aphids will survive.

Table 1. Results from test of *Sitobion avenae* on different concentrations of MBOA

Concentration in mMol	Intrinsic rate of increase r_m	Number of replicates
8.00	0.0000 A	40
4.00	0.0000 A	40
0.50	0.0000 A	60
0.30	0.0014 B	80
0.20	0.0016 B	90
0.10	0.0034 C	60
0.05	0.0040 C	90
0.00	0.0049 D	60

Figures with the same letter are not significantly different

The correlation between concentrations of MBOA and the intrinsic rate of increase has been presented in Figure 1.

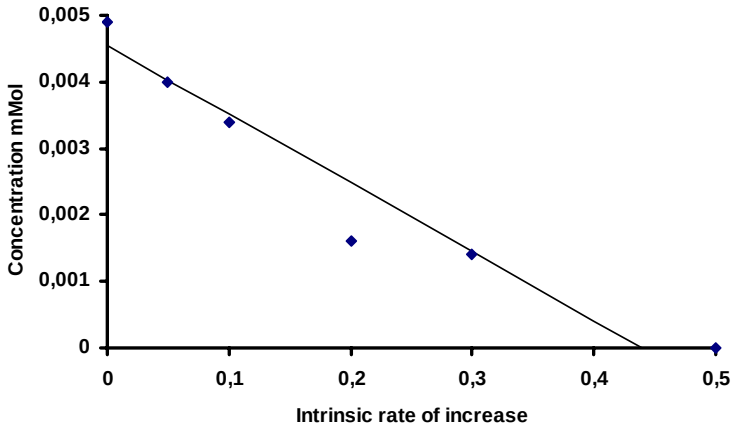

Fig. 1. Correlating values of MBOA concentration and intrinsic rate of increase of *Sitobion avenae*.
Y = 0.44 – 96.8 X; Y: MBOA concentration; X: Intrinsic rate of increase.
F-Statistics: $p < 0.002$; $r = 0.96$; $F = 52.6$; $df = 4$.

As far as I know, none winter wheat varieties have a content of DIMBOA and consequently a concentration and MBOA higher than 0.5 mMol. However, very often lower concentrations will reduce the multiplication of aphids to a level below the economic damage threshold. It is possible to breed varieties with a high content of DIMBOA and in the future this could be one of the tools to handle aphids in winter wheat and other cereal product.

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