Impact of short term high temperature and drought periods on grain aphid *Sitobion avenae* (Hemiptera: Aphididae) and its natural enemies

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Introduction

S. avenae is the most important cereal aphid damaging mainly winter wheat in Northern Germany. In the frame of the cooperative research project KLIFF (Climate impact and adaptation research in Lower Saxony) the effects of short term high temperature and drought periods, predicted by climate models, on the population dynamics of *S. avenae* and the development of one of its main natural enemies the parasitoid *Aphidius rhopalosiphi* were assessed.

Experiment 1: Heat Periods

Material and Methods

Synchronized developmental stages (L2, L3, L4, adults) of *S. avenae* were kept at 20 °C (control) and exposed to heat pattern for 8 h /day at 25, 30, and 35 °C for 1, 2, 4, and 6 days.

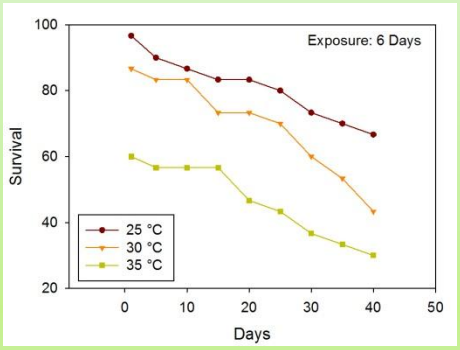

Fig.1: Survival of *S.avenae* (L2) after heat exposure for 6 days

Results

Temperatures above 25 °C had only a slight effect on the developmental time. However, with the frequency of exposure and at temperature periods of 30 and 35 °C survival rates (Fig.1) and fecundity (Fig.2) dropped significantly ($p<0.05$).

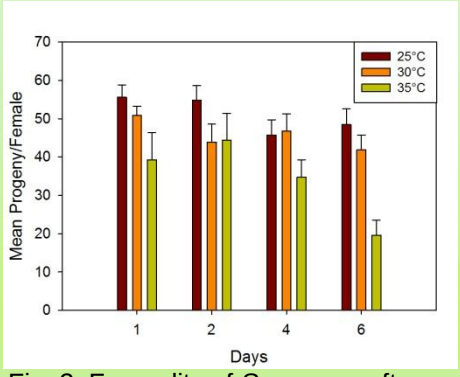

Fig. 2: Fecundity of *S. avenae* after heat exposure of L2 (mean + SE)

Experiment 2: Drought Periods

Material and Methods

Winter wheat with grain aphids and *A. rhopalosiphi* was exposed to three different levels soil water capacity:

80-90% = optimal conditions
50-60% = moderate drought stress
20-30% = heavy drought stress

Results

Drought mainly influenced population dynamics of *S. avenae* by increasing proportion of winged morphs ($p<0.05$) (Fig.2). Moreover there is a tendency for reduced parasitation rates of *A. rhopalosiphi* ($p=0.07$) after severe drought stress (Fig.2).

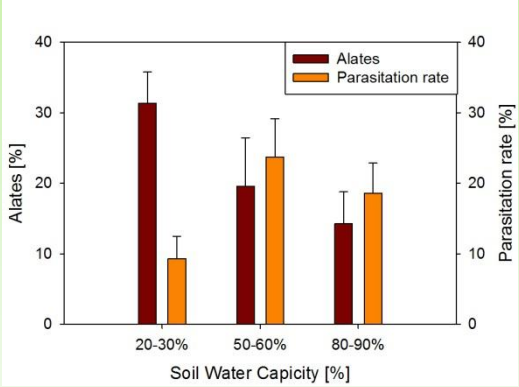

Fig.2: Proportion of alates in *S. avenae* and parasitation rate of *A. rhopalosiphi* under drought stress (mean value+SE)

Conclusion

The results indicate that the predicted climate change will lead to a decrease in survival and fecundity of *S. avenae* and to a increase in aphid dispersal. However, even short term heat and drought stress will probably cause a decrease in natural enemy regulation capacity. For modeling future population trends of *S. avenae* under heat and drought conditions modified parasitation/predation rates of key natural enemies have to be considered more in detail.

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