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New approaches to the identification and selection for Wheat dwarf virus (WDV) tolerance in wheat (*Tritium aestivum*)

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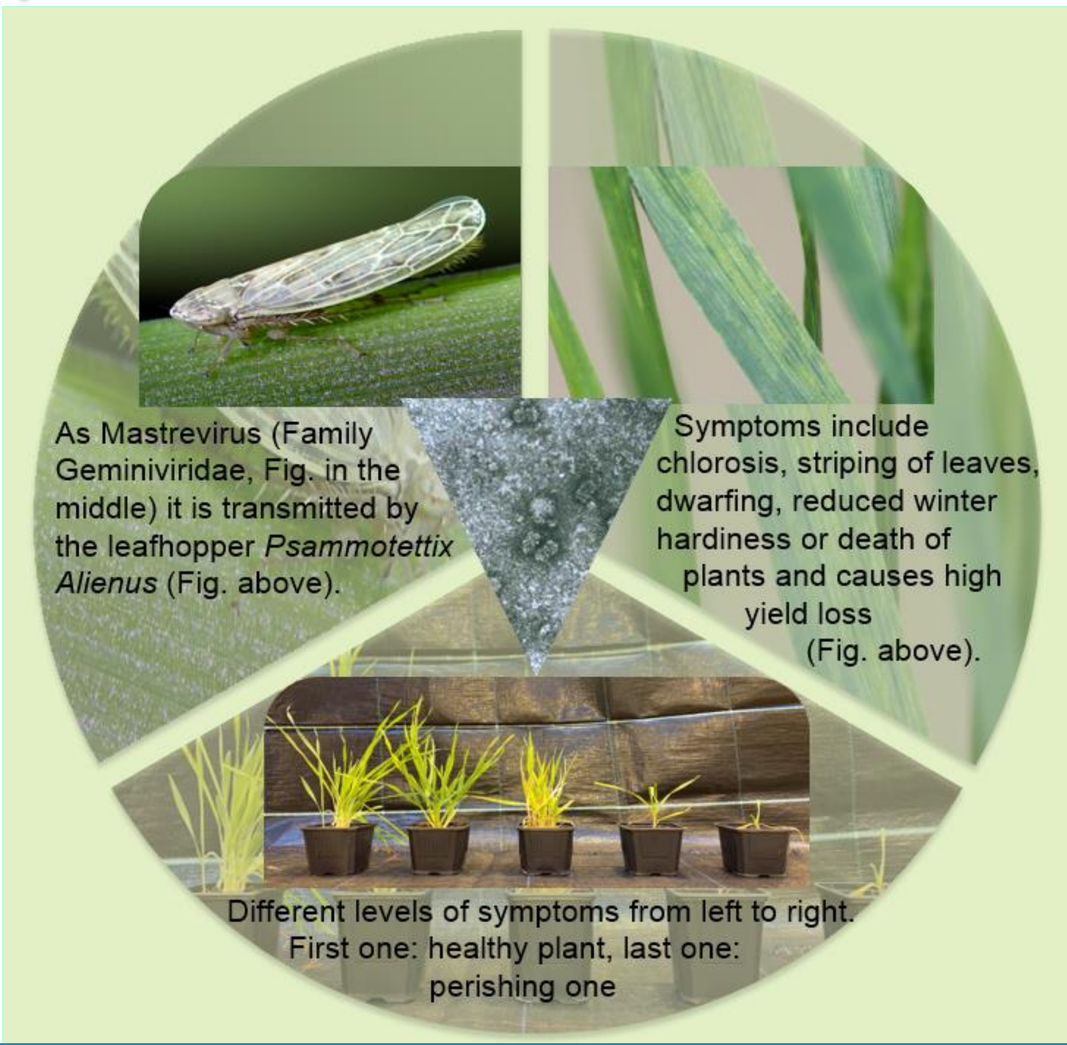
Wheat dwarf virus (WDV)

WDV is an important pathogen in many European countries and causes severe damage in plants of the family Poaceae, e.g. wheat. Due to climate change, the incidence of insect-transmitted viruses will become more important worldwide because of the increased occurrence and longer activity of the transmitting vectors in autumn. The absence of approved insecticides against *P. alienus* renders growing of WDV tolerant varieties the only effective way to control WDV.



However, selection for tolerance is time and labor-intensive. In previous studies, sowing and inoculation were carried out in gauze houses. Due to semi-open field conditions, germination and inoculation success were influenced by weather conditions. In order to conduct the trials independently, we searched for new approaches to identify and select tolerant lines. In this context, we constructed an infection hood for use in the greenhouse. In order to evaluate its efficiency, we studied the main parameters of a resistance test and compared them with results from the gauze house.

Methods

Germination rate

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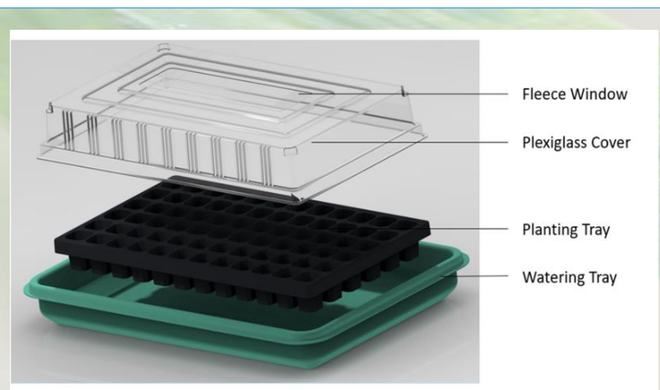

For the investigations, the recorded number of germinated plants was put in relation to the total number of plants per genotype. Based on the determined germination rates, significant differences were observed with a higher germination rate under greenhouse conditions.

Results

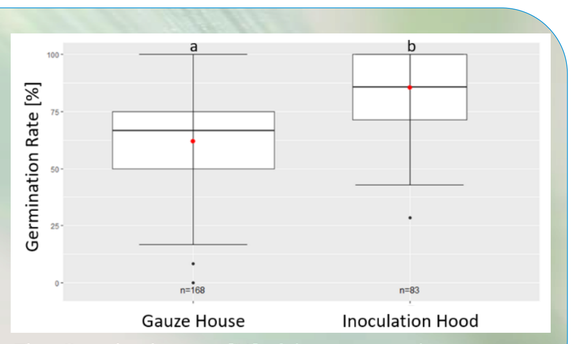

Fig.: Germination rate [%] of the two tested setups, n= number of genotypes, Mann-Whitney-U Test: p>0,05

Inoculation

BBCH 10

After germination, plants were covered with the hood and stocked with 30 leafhoppers for 14 days. This corresponds to 2.8 plants/Leafhopper. 25 °C is assumed to be the optimal inoculation temperature, while at 0 °C the leafhoppers die. Increased activity of the animals was observed from 15 °C. After inoculation, leafhoppers were removed. During inoculation, significant temperature fluctuations occurred in the gauze house, which did not occur under inoculation hood due to the controlled conditions.

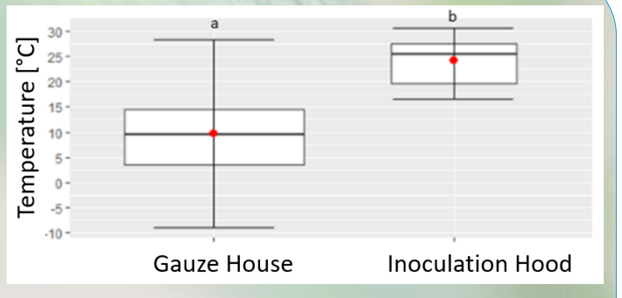

Fig: Determined temperature ranges during inoculation period, Mann-Whitney-U-Test: p>0,05

Detection of infected plants

BBCH 23-30

The infection rate is calculated from the number of infected plants detected by ELISA in relation to the total number of plants per genotype. When comparing the two variants, there were no significant differences in the infection rates determined. The relative virus titres were also not statistically significant different from each other.

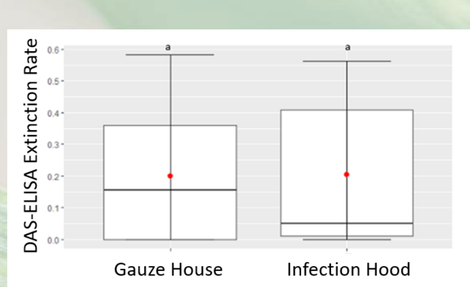

Fig: Relative virus titres of the two experimental setups, Mann-Whitney-U-Test: p>0,05

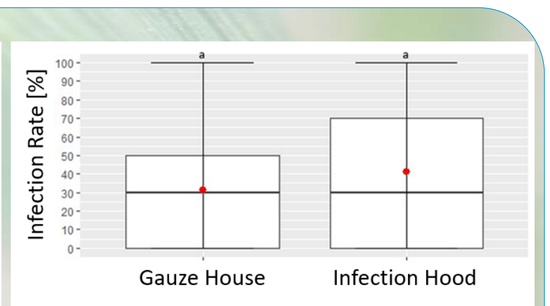

Fig: Infection rates of the two experimental setups, Mann-Whitney-U-Test: p>0,05

Conclusion

The presented inoculation hood allows uniform germination and a fixed period of inoculation. In addition, the risk of spontaneous infection in spring is minimized by removing the leafhoppers. Leafhoppers are immediately available for further trials. Without a greenhouse, the use of gauze houses is a good option.

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Literature: Benkovics AH, Vida G, Nelson D, Veisz O, Bedford I, Silhavy D, Boulton MI (2010). Partial resistance to Wheat dwarf virus in winter wheat cultivars. Plant Pathology 59(6):1144-1151.

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