Ulrike Kaiser, Mark Varrelmann
Institute of Sugar Beet Research, Holtenser Landstr. 77, 37079 Göttingen, Germany

Generation of different *Cercospora beticola* disease progress curves and yield effects by inoculation of sugar beet cultivars with varying quantitative resistance

Institute of Sugar Beet Research

Stand of knowledge

- Cercospora leaf spot (CLS, Fig. 1) is the most destructive foliar disease in sugar beet causing yield losses up to 40% in German sugar beet growing areas
- An artificial inoculation method for *C. beticola* resistance testing in the field had been developed in the 1990's [1]
- BUT: High inoculum densities resulted in extremely high infestation levels
- BUT: Due to quantitative *C. beticola* resistance, resistant plants were also affected and severly damaged under high infestation pressure

Fig. 1: CLS in sugar beet

Aim of the study

Improving the biotest of ADAMS et al. [1] by applying different inoculum concentrations in order to differentiate clearly resistant and susceptible sugar beet cultivars

Materials and methods

Fig. 2: Artificial inoculation of sugar beet with *C. beticola*

- In 2005 and 2006 field trials with artificial inoculation
- One susceptible, two resistant cultivars
- Spray inoculation (Fig. 2) at canopy closure with a mixture of five *C. beticola* isolates
- 2005 three inoculum densities (33000, 16500 and 9500 infectious units/ml)
- 2006 four inoculum densities (18400, 10500, 7200 and 2700 inf. units/ml)
- Healthy control repeatedly treated with fungicides
- Assessing disease severity of *C. beticola* (DS) weekly
- Calculation of white sugar yield (WSY) and area under disease progress curve (AUDPC)

Results

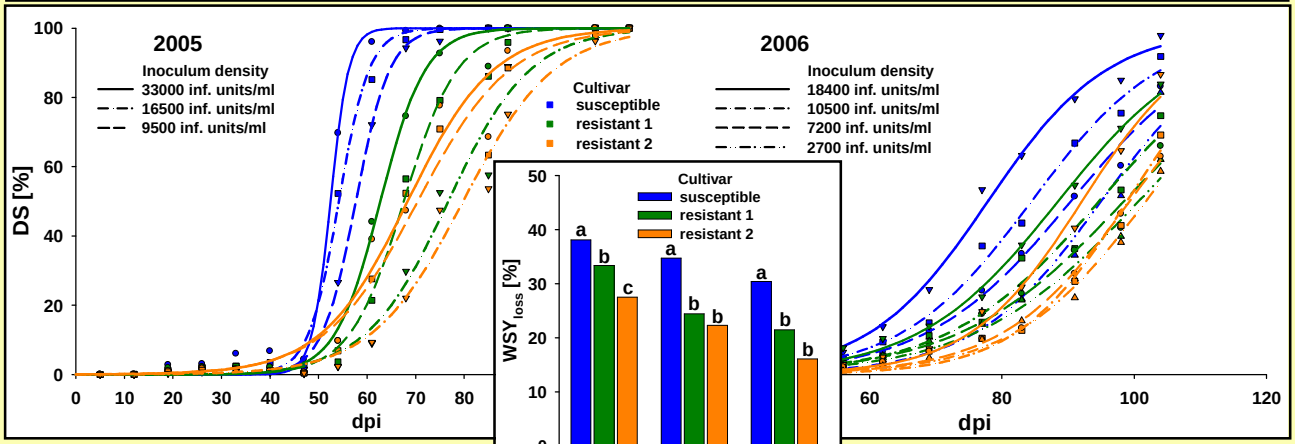
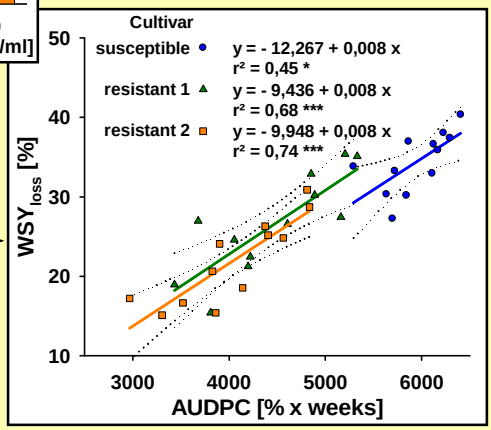


Fig. 3: Progress of disease severity of *C. beticola* (DS) depending on cultivar susceptibility level and inoculum density, 2005 and 2006, inf. units = infectious units of *C. beticola* (conidias and mycelium pieces)

- Successful infestation with *C. beticola* in both years
- DS of *C. beticola* increased earlier and faster in the susceptible than in the resistant cultivars (Fig. 3)
- In 2005 for all inoculum densities significant differences between cultivars for WSY_{loss} exist and increased with decreasing inoculum density (Fig. 4)
- In 2006 WSY was not assessed (inhomogeneous field emergence, hail damages, nematodes)
- AUDPC and WSY_{loss} correlated positively (Fig. 5)
- Same slope of regression functions independent of cultivar susceptibility

Fig. 4: Loss of white sugar yield (WSY_{loss}) of cultivars with different susceptibility to *C. beticola* on different inoculum densities, 2005

Fig. 5: Correlation between area under disease progress curve of *C. beticola* (AUDPC) and loss of white sugar yield (WSY_{loss}) of cultivars with different susceptibility, 2005



Conclusions

- Artificial inoculation is a good possibility to test *C. beticola* resistance in the field
- Clearest differentiation between cultivars in DS was given at inoculum density varying between 9500 and 18400 infectious units/ml
- Due to the strong effect of weather conditions on the progress of the epidemie an optimal inoculum density was not found
- Differences between cultivars for WSY_{loss} became more evident with decreasing inoculum densities
- Due to identical slopes of the regression functions, the lower WSY_{loss} of resistant cultivars is a result of the lower AUDPC
- Supposed tolerance reactions of resistant cultivar were not verified

[1] Literature cited: ADAMS, H., W.R. SCHÄUFELE, B. MÄRLÄNDER (1995): A method for the artificial inoculation of sugarbeet with *Cercospora beticola* under field conditions. Zeitschrift für Pflanzenkrankheiten und Pflanzenschutz, 102, 320-322

71. IIRB Congress, 13-14 February 2008 in Brussels (B)