

Effect of maize genotypes differing in susceptibility towards *Rhizoctonia solani* on subsequent infection of sugar beet with *Rhizoctonia* root and crown rot

Introduction

Rhizoctonia solani Kühn is a heterogeneous fungal species group that is distributed worldwide. Its anastomosis groups (AG) are pathogenic to a wide range of plants. *R. solani* AG 2-IIIB infects both sugar beet (Fig. 1) and maize, which are cultivated in the same rotation. The cultivation of *R. solani* resistant maize genotypes in rotation with resistant sugar beet might be an important integrated measure for disease control. We hypothesised that disease severity in susceptible sugar beet grown after maize as pre-crop is related to the susceptibility of the maize genotype.



Fig. 1: Root and crown rot of sugar beet



Fig. 2: Field site in 2003

Materials and Methods

A two-factorial split-plot field rotation experiment was set up in 2003 (Göttingen, Germany, n=6, Fig. 2). Ten maize genotypes differing in susceptibility towards *R. solani* were grown on 3*6 m² plots (factor 1). Plots were artificially inoculated or not inoculated with *R. solani* AG 2-IIIB liquid inoculum (factor 2). In 2004, a susceptible sugar beet cultivar was grown on all plots, followed in 2005 by cultivation of the same maize genotypes as in 2003. Disease severity was rated in maize and sugar beet roots and kernel and white sugar yield (WSY) were determined.

Results

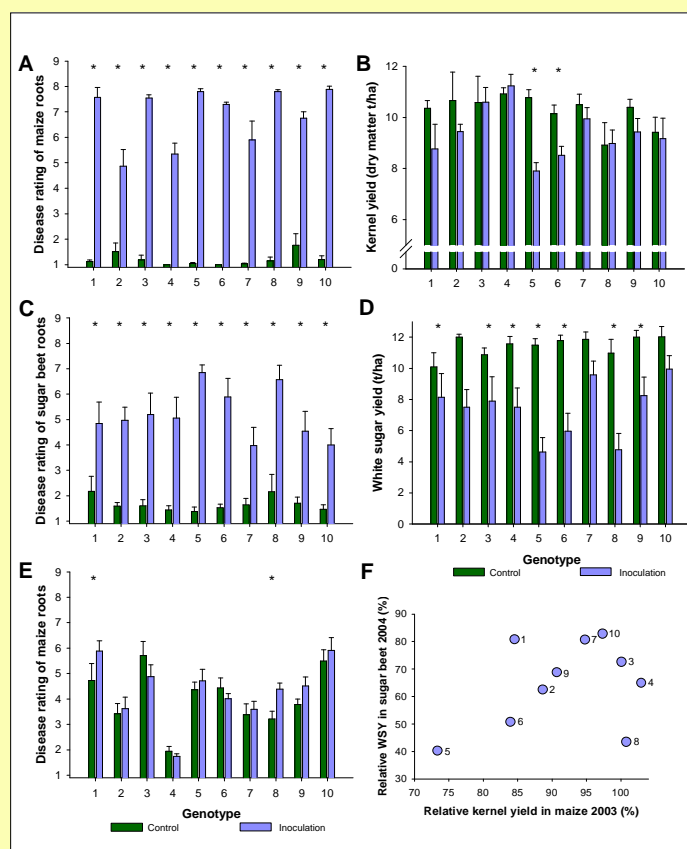
The inoculation of maize in 2003 induced strong disease symptoms both in maize 2003 and in sugar beet 2004 (Fig. 3 A, C) and to a lesser extent in maize in 2005 (Fig. 3 E). Disease ratings (2003) of maize in the field correlated with previous greenhouse ratings ($p < 0.001$).

Yield losses were genotype-specific in both crops, though higher in sugar beet (Fig. 3 B, D). There was a significant correlation between disease severity on sugar beet and losses in WSY ($p < 0.001$).

There was no correlation between disease severity resp. relative yield (Fig. 3 F) of maize and sugar beet.

Disease severity of maize in 2003 and 2005 correlated significantly ($p < 0.05$), but not kernel yields of both years.

Fig. 3: *Rhizoctonia* disease rating (A/C/E, 1 healthy, 9 dead) and yield (B/D) in a rotation of maize (A/B/E) and sugar beet (C/D) after artificial inoculation of 10 maize genotypes (1-10) in 2003. A/B: maize genotypes (2003); C/D: susceptible sugar beet variety (2004); E: maize genotypes (2005). *significant difference between inoculated and control plots ($p < 0.05$). F: Relation of relative kernel yield in maize in 2003 and relative WSY in sugar beet 2004 (Yield of inoculated relative to control plots).



Conclusions

Maize genotypes differed in their susceptibility towards *R. solani*, which was not necessarily reflected in yield losses.

Maize genotype nevertheless influenced the sugar beet crop.

These effects cannot only be attributed to differences in susceptibility of the grown variety.

Maize genotype seems to influence the inoculum potential of *R. solani* in the soil.

Possible explanations might be that harvest residues of maize genotypes differentially influence the saprophytic survival of *R. solani*, or that maize genotypes induce soil suppressiveness in a genotype-specific way.

These questions represent important future research issues.