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ScienceDirect
Procedia Environmental Sciences 29 (2015) 232 – 233
Procedia Environmental Sciences

Agriculture and Climate Change- Adapting Crops to Increased Uncertainty (AGRI 2015)

Impact of elevated atmospheric CO_2 level on powdery mildew (*Blumeria graminis* f.sp. *tritici*) severity in wheat depends on the pathotype × genotype interaction

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Abstract

Disease resistance is influenced by a variety of environmental factors. The rise in the atmospheric CO_2 level affects plant metabolism, physiology and development; which has an impact on pathogen invasion and the disease progress. The aim of the present work was to investigate the effect of CO_2 enrichment on powdery mildew (PM) infection in winter wheat. Disease severity caused by two PM pathotypes was studied in Conviron PGV-36 growth chambers at ambient (390 ppm) and elevated (750 pm) CO_2 levels on seven varieties with different levels of resistance.

Elevated CO_2 (EC) resulted in more severe PM infection by pathotype R51 in most genotypes (Bezosztaja 1, Ukrainka, Libellula, Mv Mambo, Mv Emma), compared to ambient CO_2, while pathotype R76 caused similar or lower infection level depending on the genotype. The two pathotypes, however, affected Ukrainka in a different way, as R51 resulted in higher while R76 in less severe infection due to elevated CO_2. In the case of Apache, neither pathotype caused any change in PM severity in response to EC. The resistant variety, Mv Regiment, remained resistant to either R51 or R76 even at EC.

During the progress of PM infection, the stomatal conductance of infected wheat leaves increased in general, at both CO_2 levels. Despite the fact that R51 has the most virulence factors (infecting all of the 8 wheat genotypes used in the Nover differential set for identification of PM pathotypes while R76 infects 7; Frauenstein *et al*. 1979), R76 usually caused more severe initial disease symptoms than R51 at ambient CO_2 level. In three varieties (Bezosztaja 1, Ukrainka, Libellula), however, R51 lead to the most severe final infection level.

These findings underline the importance of resistance traits against diseases in a future environment with elevated atmospheric CO_2 levels.

This research was supported by the National Scientific Research Fund OTKA K-105949.

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Peer-review under responsibility of the organizing committee of the Agriculture and Climate Change - Adapting Crops to Increased Uncertainty (AGRI 2015)
doi:10.1016/j.proenv.2015.07.288

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Keywords: elevated CO_2; powdery mildew; wheat

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