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Publication date:
2009

Document version
Publisher's PDF, also known as Version of record

Citation for published version (APA):
Jensen, J. D., Frenck, G., Jørgensen, R. B., Mikkelsen, T. N., Collinge, D. B., Jørgensen, H. J. L., & Lyngkjær, M. F. (2009). *Climate change effects on plant health*. Abstract from Climate Change, Global Risks, Challenges & Decisions, København, Denmark.

ABSTRACT BOOK

SESSION # 37

P37.23

Climate change effects on plant health

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Our objective with this study is to investigate how the predicted changes in our future climate may affect growth of crop plants and their interaction with pathogenic microorganisms, so it is possible to meet any predicted harmful effects.

Even though plant diseases are a major constrain on plant productivity, there is only limited knowledge about how climate change will affect plant health. It is important to prepare plant production for future conditions, given the time span required for development of new plant varieties. In order to do this, it is necessary to have detailed knowledge of how plants responses to diseases are affected by the predicted change in the climatic factors, CO_2, tropospheric ozone (O_3) and temperature. The expectation is that climate change could alter rates of pathogen development, modify host resistance and lead to changes in the physiology of host-pathogen interactions. However, at present, hardly any research exists on effects by multifactor climate change and much more additional research is needed.

Fusarium graminearum (*Fg*), is a fungal pathogen that courses head blight in cereals. It sometimes produces myco-toxins, e.g. deoxynivalenol (DON), which are harmful to human and animal health. However, the exact circumstance behind induction of toxin production *in planta* is not known. Previously, *in vitro* studies showed that myco-toxin accumulation is altered during oxidative stress, however it is not clear how myco-toxin accumulation is affected *in planta* by plant derived oxidative stress. In the present study, we investigate how *Fg* respond to oxidative stress *in planta,* caused by ozone alone and in combination with elevated CO_2 and temperature, and if humans and animals will encounter more problems with myco-toxins contaminated cereal-derived products in the future climate.

Initially, the effects of elevated CO_2, ozone and temperature were investigated in four genotypes and three F1 population of barley (*Hordeum vulgare*). Plants were cultivated in multi or single factor treatments with CO_2 (385 ppm and 700 ppm), O_3 (20 ppb and 60 ppb) and temperature (19/12 °C and 24/17 °C), i.e. climate factor values as they are today and are forecasted to be in year 2075. Plants were grown at a plant density corresponding to that found in cultivated fields. Physiological responses were observed and production parameters (thousand grain weight, seed size ratio, biomass, yield, seed number and plant height) were measured in six different environments:

Treatment	Factor	CO_2	O_3, day/night	Temperature, day/night
Elevated 1	Multi: CO_2 + Temp. + O_3	700 ppm	60/20 ppb	24/17 C
Elevated 2	Multi: CO_2 + Temp.	700 ppm	20/20 ppb	24/17 C
Elevated 3	Single: CO_2	700 ppm	20/20 ppb	19/12 C
Elevated 4	Single: Ozone (O_3)	385 ppb	60/20 ppb	19/12 C
Elevated 5	Single: Temperature	385 ppb	20/20 ppb	24/17 C
Ambient		385 ppb	20/20 ppb	19/12 C

Responses to the environments differed between genotypes and F1 populations, but there were some general tendencies, the measured production parameters:

- Elevated CO_2 increased yield, biomass and seed number.
- Higher temperatures decreased yield and biomass.
- Elevated O_3 decreased yield.
- The two multifactor combinations, i.e. elevated CO_2 + temperature + O_3 and elevated CO_2 + temperature, corresponding to the predicted year 2075 climate scenario in southern Scandinavia - decreased most production parameters.

Presently, we are investigating effects of elevated CO_2, O_3 and temperature on myco-toxin accumulation in barley. The experiment is conducted in the six environments depicted above, where 3-4 weeks old plants are inoculated with *Fg* and both fungal and plant responses are investigated, including accumulation of myco-toxin in the infected plants.