# Effects of experimental warming on three economically important pathogens in oilseed rape

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The potential rise in temperature due to the assumed climate change might affect both crop and fungal pathogen development in the future. Within the research framework KLIFF (Climate Change Research in Lower Saxony, Germany), potential effects of rising temperatures on oilseed rape development and three major fungal diseases of this crop were investigated experimentally utilizing climate chambers and a field soil warming facility in two consecutive growing seasons. With the two experimental approaches, potential effects of rising air and soil temperatures on soil- and plant debris-borne life cycle stages of the three economically important oilseed rape pathogens, *Phoma lingam*/*Leptosphaeria maculans*, *Sclerotinia sclerotiorum* and *Verticillium longisporum*, were studied. Treatments reflected warming scenarios for Lower Saxony, Germany, by 2050 (mid term) and 2100 (long term) as projected by regional climate models. Investigations included (1) development of Phoma crown canker in spring (field only), (2) apothecia production of *S. sclerotiorum* in spring and (3) colonization of winter oilseed rape by *V. longisporum*. Results of two climate chamber experiments and the two field growing seasons 2010/11 and 2011/12 showed that oilseed rape growth and development responded linearly to increasing temperatures with an average flowering advance of 7 days per 2°C warming.

Development of phoma crown canker in the field showed large variation in response to the warming treatments with no clear trend towards rising temperatures. Maximum germination of *S. sclerotiorum* sclerotia was 4 to 7 days earlier under a 2°C temperature increase, potentially advancing the oilseed rape infection window in the future, which would not represent an overall increase in disease risk. *V. longisporum* colonization correlated with progress in plant development and was advanced in warmer chambers and plots. In the field experiment 2010/11, plants growing in warmest plots were significantly stronger colonized with *V. longisporum* than plants of all other plots, particularly in the susceptible cultivar Falcon compared to a tolerant genotype. The results suggest that warming may be an additional driver for an increased importance of this soil borne pathogen in the future, besides short crop rotations.