

Topic: Climate-related changes in environment, pests and diseases on agricultural production

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Effect of climate changes on plant disease under simulated conditions: challenges and limits.

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Increases in CO₂ and temperatures are expected to induce complex effects on plant pathogens. Different approaches were used to study the effect of climate on plant diseases, including laboratory and/or field studies, as well as modeling-based assessments and simulations under phytotrons. During the last 10 years, the impact of climate changes such as increased CO₂ and temperature on pathogens affecting grapevine, basil, rocket, beet, lettuce, zucchini, radish, bean and geranium was assessed under phytotrons. Plants were grown under different simulated climatic conditions, at standard (400-450 ppm), average (600 ppm) and high (800 ppm) CO₂ concentration and at standard (ranging from 18 to 22/24°C) and elevated temperature (4°C higher than standard). Variable effects were observed when individual parameters were taken into consideration. An increase of downy mildew on grapes, of powdery mildew on zucchini, of *Alternaria* leaf spot on rocket salad, of black spot on basil and of *Phoma* leaf spot on garden beet was observed when both CO₂ level and temperature increased. Powdery mildew of grape was not influenced by increasing carbon dioxide and temperature. Downy mildew of basil and rusts affecting bean and geranium increased at higher CO₂ levels, but only at lower temperatures, while the combination of high CO₂ and high temperature lead to a reduction of the diseases. Regarding the effects of climate changes on *Fusarium* wilt of lettuce and rocket, the soil fungal and bacterial development was not affected by the different CO₂ and temperature levels, while an increasing disease incidence was observed at high CO₂ and high temperature, probably through plant-mediated effects. The role of phytotrons in the study of climate changes is discussed.