

DOI: 10.1515/ffp-2016-0019

## European oak decline phenomenon in relation to climatic changes

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### ABSTRACT

The complex phenomenon of decline in European oak is currently triggered by changing climatic conditions and their consequences like heavy rains, local floods and pest development. Especially, pathogens from *Phytophthora* genus profit from soil saturation with water. They are alien invasive species, which attack and severely damage fine roots. In drought conditions occurring in the subsequent year, many oaks die as they encounter problem with water uptake. Additionally, insect defoliators followed by oak mildew infections accelerate the level of tree mortality. Secondary insects, butt and root pathogens are usually the final cause of death of many oaks. More research is needed in the direction to determine (i) measurable factors (e.g. chlorophyll fluorescence) that can indicate that the process of tree decline has already started, (ii) the correlation between the root decay and the crown symptoms (scanners, software), (iii) which combination of stressors stimulate the best development of pathogens that lead to the high plant mortality and (iv) the difference between the mortality caused by the native and the invasive *Phytophthora* species.

### KEY WORDS

*Quercus* spp., *Phytophthora*, *Armillaria* spp., climate change, pathogen, pests

### INTRODUCTION

The impact of recent global climate change has been well documented through changes in plant phenology, morphology and abundance (Richardson et al. 2013). Damages to forests caused by the extreme climatic events have also been well documented (Linder et al. 2010). The climate change scenarios for the 21st centu-

ry had predicted changes in the ecosystems, which will cause many difficulties for oaks to adopt and mitigate these new environmental conditions (Corcobado et al. 2014; Linder et al. 2010; Borja et al. 2008). During the 21st century, the temperature will continue to raise (according to different scenarios) between 1.1 and 6.4°C (IPCC, 2007), causing many problems to plants and even more complex ecosystems such as forests.













