

Detection of natural infection of *Quercus* spp. by the chestnut blight fungus (*Cryphonectria parasitica*) in Hungary

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Summary: The chestnut blight fungus *Cryphonectria parasitica* (Murrill) Barr [syn.: *Endothia parasitica* (Murr) Anderson] caused almost total destruction of the American chestnut (*Castanea dentata*) and widely spread on European chestnut (*Castanea sativa*) in many European countries. In Hungary, because this fungus threatens most of the Hungarian chestnut stands, great efforts have been made to delay its spread. Biological control with Hungarian hypovirulent strains of the pathogen seems to be an effective method for saving the affected chestnut trees. Until 1998 the fungus was detected on *Castanea sativa* only, then on some trees of young *Quercus petraea* in mixed chestnut forests, which also showed the typical symptoms of blight (Kőszeg and Zengővárkony). Although blight symptoms are not so serious in *Quercus* spp. than in *Castanea* spp., it seems that *C. parasitica* threatens the young *Quercus* spp. in Hungary, mainly in heavily infected chestnut forests. This is the first report of *C. parasitica* cankers on oak in Hungary.

Key words: *Cryphonectria parasitica*, European chestnut, *Quercus petraea*

Introduction

Chestnut blight, caused by *Cryphonectria parasitica* is an introduced pathogen of *Castanea* species in North America and Europe. It destroyed most American chestnut trees (*Castanea dentata*) within a few decades after its introduction into the eastern part of the United States at the beginning of this century (Anagnostakis, 1987). This pathogenic fungus was first reported in Europe in an Italian chestnut forest near Genova in 1938 (Biraghi, 1946). In Europe, within a few decades *C. parasitica* spread epidemically and heavily infected European chestnut (*Castanea sativa*) stands. The chestnut blight fungus is also threatening chestnut stands of Central Europe, including Austria (Donaubauer, 1964), Hungary (Körtvély, 1970) and Slovakia (Juhasova, 1992). In Hungary, chestnut stands have already been seriously damaged by this parasite (Radócz, 1999).

Description of the pathogen

(Followed by Sivanesen & Holliday, 1981)

Casual agent

The chestnut tree blight fungus (teleomorph: *Cryphonectria parasitica* (Murrill) Barr [syn.: *Endothia parasitica* (Murr) Anderson]; anamorph: *Endotiella parasitica* (Murrill) Barr.) is an ascogenous pathogen causing blight on some species of *Fagaceae* family (such as *Castanea* spp., *Fagus* spp., *Quercus* spp.).

Fruiting bodies and spores

Stromata. Stromata are scattered, often confluent at first immersed in the peridium becoming erumpent, valsoid, yellow to yellowish brown, prosenchymatous, up to 3 mm wide and 2.5 mm high.

Peritecia, asci, ascospore. Peritecia are grouped more or less oblique, globose to depressed globose, up to 400 µm broad with dark brown to black. Cylindrical, ostiolar beak converging through the stromatic disc and exposing the dark papillae at the surface with the pore lined on the inside by hyaline, filiform, periphyses; beaks up to 900 µm long and 200 µm wide. Peritecia produce numerous asci and ascospores. Asci clavate to clavate cylindrical, thin walled, 8 spored and 32–55 x 7–8 µm. Ascospores are irregularly biserial in the ascus, hyaline, one septate, elliptic, usually straight and 7–12 x 3–5.5 µm.

Conidioma, Conidiophore, Conidia. Conidiomata pseudostromatic, immersed, erumpent, separate or aggregated, yellow to yellowish brown, globose, variable in size up to 300 µm wide, 60 µm long. The conidioma produces numerous conidia on conidiophores. Conidiophores are branched, septate, hyaline, smooth, tapering at the apex with an indistinct channel and collarette. Conidia are hyaline, one celled, ellipsoidal to somewhat bacilliform and 3.5 x 1–1.5 µm.

Symptoms

On young stems, brown lesions form on the smooth bark, some discoloration also occurs when older stems are



Figure 1 Chestnut blight canker on *Castanea sativa* (Photo: L. Radócz)

attacked, mainly through wounds. Lesions become sunken as bark and cambium are killed. There is a swelling and cracking of the outer bark (Figure 1). Death of the cambium of this ringporous tree prevents formation of the xylem vessels needed for liquid transport and this causes wilting of the leaves above (beyond) the lesion. Pycnidia are very abundant on the cankerous bark, exuding spore tendrils under moist conditions. Pale brown, mycelia as fan-like drawings appear in the inner bark. Those European chestnut trees with generally one or more cankers die within 1 or 2 years after the canker has appeared.

Chestnut blight in the Hungarian chestnut stands

The chestnut tree blight fungus was reported first in Hungary on the border of Nemeshegy village (Zala county) in 1969 (Körtvély, 1970). The presence of the fungus was thought to be unique. Detailed assessments of spreading of the fungus were started by experts from the Hungarian Ministry of Agriculture in 1970. Four years of research (1970–1974) showed that the pathogen occurred in almost all Hungarian chestnut stands and nurseries (Eke & Gál, 1975). Quick orders (negative selection, *C. parasitica* was established as a quarantine organism) delayed the fast spread of the pathogen. Serious destruction of chestnut stands by *C. parasitica* called attention to this pathogen again at the beginning of the 1990's. A four-year-study started in 1993 showed that 10–70% of 24 chestnut stands were infected by the pathogen (Radócz, 1997). Several large chestnut populations (such as ancient chestnut stands of Zengővárkony or Pécsvárad) were greatly threatened by the parasite (disease incidence reached 90%). These facts have generated research on control of the chestnut blight. According to the extensive control research and good field results in Western Europe and in the United States, this seemed to be the best way to study the possibility of a biological control method using Hungarian hypovirulent strains of *C. parasitica*. 36 strains of the pathogen were studied from 19 Hungarian chestnut stands (in south- and

west-Hungary). A total of 13 VCGs (Vegetative Compatible Group) were identified from the 19 study sites and 10 hypovirulent strains of *C. parasitica* were identified from different Hungarian regions (Radócz, 1998). Further study showed that 17 VCGs could be introduced in Hungary so far (Radócz, unpublished).

The appearance on *Quercus* spp.

In the United States and in a few European countries, *C. parasitica* caused bark necrosis on some species of the genus *Quercus* (Torsello et al., 1994). There have been relatively few reports regarding the percentage of oak trees infected with *C. parasitica*. In 1994 they reported that 15.5% of the oaks in Pennsylvania (mountains regions) were infected with the chestnut blight fungus. In Hungary, the fungus was detected on *Castanea sativa* only until 1998, then some young *Quercus petraea* seedlings also showed the typical symptoms of blight at Kőszeg (Figure 2). Symptoms were similar to chestnut bark necrosis and we found fruiting bodies of the pathogen on the edge of the cankers. In 2000 we also found infected *Quercus petraea* trees with the same bark necrosis at Zengővárkony. Symptoms were never higher in the infection scale than disease grade 2 (ref. Radócz, 1997) and we only observed dead parts of some of the oak branches due to this parasite. Laboratory identification showed that *Quercus* spp. trees were infected by some of the same *C. parasitica* strains that we already detected from chestnut. We suppose that *Quercus petraea* infections were caused by the inoculum originated from fruiting bodies of chestnut bark cankers. It was also reported in the results of inoculation trials (involving several oak species) that the virulence of *C. parasitica* isolated from oaks was equal or higher than that of isolates collected from chestnut (Nash & Stambaugh, 1982). Our preliminary *in vitro* examinations showed that biological control of *Quercus* species by hypovirulent strains of the pathogen is also possible such as on chestnut, but many isolates of the virulent strains are necessary to clarify the pathogenicity and VCGs. Although blight symptoms are not so serious on



Figure 2 Blight canker on young *Quercus petraea* (Photo: L. Radócz)

Quercus spp. as on *Castanea* spp., *C. parasitica* may infect the young *Quercus* spp. in mixed Hungarian forests. Consequently, more research is required on the practical use of the hypovirulent strains of *C. parasitica* on both *Castanea* and *Quercus* species.

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