EXAMINATION OF *CRYPHONECTRIA PARASITICA* (MURR.) BARR IN NORTH-TRANSYLVANIA ON EUROPEAN CHESTNUT AND ON OAK SPECIES

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Abstract

„Chestnut blight" disease caused by the Cryphonectria parasitica (Murr.) Barr [syn: Endothia parasitica (Murr.) And.] causes big damages of the chestnut stands throughout the World. In 1969, symptoms of the pathogen were reported first on chestnut in the Carpathian-Basin, in Hungary. Until 1998, the fungus was detected only on chestnut in the Carpathian-Basin. Then blight symptoms were also detected on some young sessile oak (Quercus petraea) trees in South-Transdanubie (Hungary). Main goals of our studies were investigations Cryphonectria parasitica infection on European chestnut and on in Romania,near Baia Mare, to detect the symptoms of Cryphonectria parasitica. During our examinations, blight symptoms were identified on chestnut and on oaks too on the Romanian test sites. One pathogen strain (EU-12). were identified from bark samples of Romanian infected chestnut and oak trees., C. parasitica caused serious destruction on chestnut populations near Baia Mare and its apperance was also identified on oaks. , Although symptoms were not so serious on Quercus petraea than on Castanea sativa, it seems that Cryphonectria parasitica became a new serious threaten for young oak trees in North-Tarnsilvania,, mainly in heavily infected chestnut forests.

INTRODUCTION

„Chestnut blight" disease caused by the fungus *Cryphonectria parasitica* (Murr.) Barr [syn: *Endothia parasitica* (Murr.) And.] (anamorf: *Endothiella* sp.) results in great damages of the chestnut stands throughout the World. At the beginning of the XXth century it destroyed almost the whole American chestnut [*Castanea dentata* (Marsh.) Borkh.] populations on 4 million hectares in the USA. (Anagnostakis, 1987). In the middle of the last century, it was also reported in Europe on European chestnut (*Castanea sativa*) near Genova (Italy) in 1938 (Biraghi, 1946). Then symptoms of the fungus were detected in the Carpathian-Basin, including Hungary (Körtvély, 1970), Austria (Donaubauer, 1964), Slovakia (Juhasova, 1976), Romania (Florea and Popa, 1989) and Ukraine (Radócz, 2001).

At the second part of the last century, typical blight symptoms were observed on some oak trees in the USA (Torsello et al., 1994), in Switzerland (Bissegger and Heiniger, 1991) and in South-Italy (Dallavalle and Zambonelli, 1999). Until 1998, *C. parasitica* in Hungary was detected only on *Castanea sativa*. But later some young *Quercus petrea* trees were found in mixed chestnut-oak forests which showed typical blight symptoms at Zengővárkony and Kőszeg (Radócz and Holb, 2002) (Figure 1). Although symptoms were not so serious on *Quercus petraea* than on *Castanea sativa*, it seems that *Cryphonectria parasitica* became a new serious threaten for young oak trees in the Central-European countries, mainly in heavily infected chestnut forests Tarcali and Radócz, 2007).

Successful protection against *Cryphonectria parasitica* is a very difficult question (Szabó, 2003). Conventional control methods against the fungus are not applicable with a great success because of the extreme pathogenici of the fungus, and the other charasteristics of sites and host-plants. Professional mechanical treatments could delay the spread of the infection, but it is not sufficient. Some tests were carried out to adapt a resistant species

[*Castanea mollissima*(Bl)] in Europe, but it was not adequate. There was the problem that this Chinese chestnut reacted to the European climate badly, on the other hand its nut quality were worse than European chestnut has. Practical application of hipovirulent strains is an efficient biological method to protect chestnut trees against *Cryphonectria parasitica* (Radócz, 2002). The method using hipovirulent strains was also adapted in Hungary and applied in chestnut plantations with good results. But it is not adapted yet in the case of oak infections by *C. parasitica* (Radócz and Tarcali, 2009). According to our experiences the susceptibility of oaks to the pathogen is more moderate than the chestnut (Tarcali et al, 2006). Up today, chestnut blight infection occured principally on young oak trees mostly in mixed chestnut-oak populations (Tarcali, 2007).

Field investigations were done in several regions of the Carpathian-basin to examine oaks to find possible blight symptoms on those. During the field works, bark samples were collected for laboratory examinations and identifications. Main goals of our studies were the followings:

- investigation of damages caused by *C. parasitica* on oak trees,
- analysis of the collected samples and testing the isolates in laboratory.

MATERIALS AND METHODS

Field examinations were done in chestnut-oak mixed forests near Baia Mare (North-Transylvania) on 7 test site between 2002-2006. During the field works, chestnut and oak trees were investigated in the test sites by visually according to the classification systems (*Table1-2*). Bark samples were collected from the infected or suspected trees with a disinfected sharp scalpel for laboratory identifications and further examinations.

In the laboratory PDA (potato-dextrose-agar) media were used. Surfice sterilized bark samples were cultivated on PDA media and the isolates were incubated for 7 days in a climated chamber. Then vegetative compatibility tests were done, when isolates were paired to study their compatibility. Finally, the pure cultures of the isolates were paired with EU-tester strains to classify their Vegetative Compatibility Groups (VCG-s). Those isoletes which formed a visible barrage zone at the edge of the growing mycelia were classified into different VCG-s

Table 1

Classification system degrees on chestnut (according to Radócz, 1998)

Infection degree	Damage of leaves (%)	Damage of bark tissue (%)
Healthy tree	0 %	0 %
I.	< 10 %	Max. 10 %
II.	11-25 %	Max. 25 %
III.	26-50 %	Max. 50 %
IV.	51-99 %	Max. 99 %
V.	100 %	Dead tree or dead tree with spear growing

Table 2

Modified classification system degrees on chestnut (according to Szabó, 2003; Tarcali and Radócz, 2007)

Infection degree	Symptoms on foliage	Symptoms on the trunk
I.	No symptoms	No symptoms
II.	Suspected symptoms	Suspected symptoms
III.	1 cancer	1 cancer
IV.	Several cancers	Several cancers
V.	100 Dead tree or dead tree with spear growing %	Dead tree or dead tree with spear growing

RESULTS AND DISCUSSIONS

Cryphonectria parasitica was reported in Romania on chestnut in 1984, but there were not any other examinations. Our investigation was the first near Baia Mare. 7 chestnut sites were studied betweeen 2002-2006 (*Figure 1*).

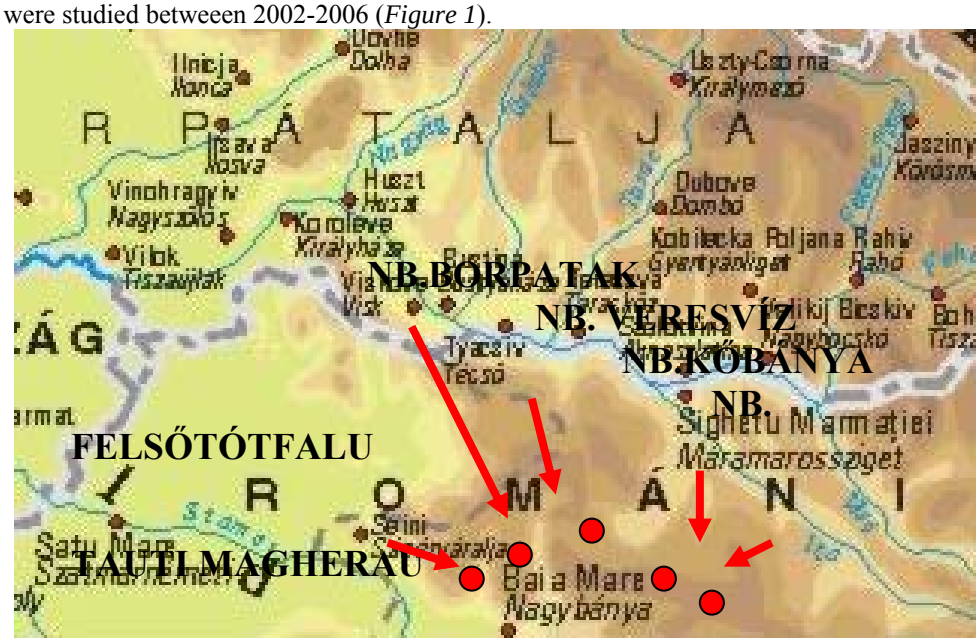

Fig. 1: Map of test site near Baia Mare

The symptoms of *C. parasitica* were detected on chestnut trees on all test sites. It was found that *C. parasitica* was spread throughout the territory on chestnut and symptoms of the pathogen were visible well, but differences were observed in the destruction among the growing sites. The infection ratio (I%) were very high (I%: 24-90) at the first field investigation on 22.03.2002. The infection index (Ii) showed also high infection of *C. parasitica* (Ii: 2,00-4,28 on the scale between 1-5). Chestnut populations were seriously damaged by the fungus (*Figure 2-3*), and high ratio of chestnut trees were killed by *Cryphonectria parasitica* fungus (*Table 3*). Than field examinations were repeated yearly until 08.11.2006. according to *Table 3,* and the infection ratio increased year by year as it is visible on chestnut blight infection trend analysis (*Figure 7*).

After field investigations, laboratory examinations were carried out. Examinations in laboratory showed that all of the isolates origined from Romanian chestnut growin areas were virulent (*Figure 5*).. Hypovirulent strains were not identified. All of the isolates were compatible with each other, accordingly only 1 VCG of the pathogen (EU-12 fungal strain) exists on the examined Romanian stands.

Between 2004 and 2006 field examinations were extended over the sessile oak trees (*Quercus petraea*) on the examined chestnut areas near Baia Mare on five different chestnut populations (Baia Mare-Tautii de S., Baia Mare-Kőbánya, Baia Mare-Borpatak, Baia Mare-Veresvíz, Tautii Magheraus) which were mixed several oak trees (*Figure 1*) In 2004, infected sessile oak trees with bark necrosis were also found near Baia Mare (*Figure 4*). The ratio of infection on oak (I%) was less than on chestnut (I%: 4-20) but the index of infection very high (Ii%: 2,66-3,00) Then it was experiences that chestnut blight infection is increasing year by year on sessile oak in the examined Romanian populations (*Table 4*). According to the results of the laboratory examinations oak trees were infected by the same *C. parasitica* strain (EU-12) that was detected from chestnut in Romania (*Figure 6*).

Fig. 2: Infected chestnut (Ii-1) near Baia Mare

Fig. 3: Dead chestnut tree (Ii-5) on Baia Mare Veresvíz test site

Fig. 4: Infected sessileoak near Baia Mare

Fig. 5: Virulent isolate from chestnut

Fig. 6: Virulent isolate from sessile oak

Table 3

Results of field examinations on European chestnut in Baia Mare

Test Sites	Time of field examinations	Examined trees	Infection degrees						Ii	I %
			Healthy tree	I.	II.	III.	IV.	V.		
NBB	I. 22.03.2002.	100	76	12	5	4	1	2	2,00	24
NBB	II. ..18.06.2003.	100	70	11	6	6	2	5	2,47	30
NBB	III. 11.06.2004.	100	71	6	11	5	1	6	2,66	29
NBB	IV. 15.11.2005..	100	66	8	10	7	1	8	2,74	34
NBB	V. .08.11.2006.	100	55	7	15	10	5	8	2,82	45
NBV I.	I. 22.03.2002.	100	45	8	4	13	7	23	3,60	55
NBV I.	II. ..18.06.2003.	100	43	9	5	7	10	26	3,68	57
NBV I.	III. 11.06.2004.	100	41	10	4	10	11	24	3,59	59
NBV I.	IV. 15.11.2005..	100	43	7	7	10	8	25	3,65	57
NBV I.	V. . 08.11.2006.	100	40	6	10	7	9	28	3,72	60
NBV II.	I. 22.03.2002.	100	10	5	7	6	11	61	4,28	90
NBV II.	II. ..18.06.2003.	100	3	3	8	14	10	65	4,39	97
NBV II.	III. 11.06.2004.	100	7	2	3	15	4	69	4,45	93
NBV II.	IV. 15.11.2005..	100	6	4	5	8	7	70	4,39	94
NBV II.	V. .08.11.2006.	100	5	5	6	7	8	69	4,37	95
NBV III.	I. 22.03.2002.	100	60	9	12	6	3	10	2,58	40
NBV III.	II. ..18.06.2003.	100	53	5	10	9	7	16	3,40	47
NBV III.	III. 11.06.2004.	100	51	8	7	9	6	19	3,31	49
NBV III.	IV. 15.11.2005..	100	41	14	10	7	9	19	3,15	59
NBV III.	V. .08.11.2006.	100	40	12	11	9	6	22	3,15	60
NBK	I. 22.03.2002.	100	52	14	7	8	7	12	2,91	48
NBK	II. ..18.06.2003.	100	51	11	7	10	11	10	3,04	49
NBK	III. 11.06.2004.	100	44	16	9	9	7	15	2,82	56
NBK	IV. 15.11.2005..	100	40	18	8	10	8	16	2,93	60
NBK	V. .08.11.2006.	100	38	13	10	11	9	19	3,18	62
NBF	III. 11.06.2004.	50	30	6	7	1	2	4	2,55	40
NBF	IV. 15.11.2005..	50	29	6	5	1	1	7	2,76	42
NBF	V. .08.11.2006.	50	21	8	9	2	2	8	2,76	58
NBT	III. 11.06.2004.	50	33	11	3	1	1	1	1,71	34
NBT	IV. 15.11.2005..	50	30	10	2	3	2	3	2,30	40
NBT	V. .08.11.2006.	50	28	8	4	3	3	4	2,60	44

Table 4

Results of field examinations on Sessile oak in Baia Mare

Test sites	Time of field examinations	Examined trees	Infection degrees						Ii	I %
				I.	II.	III.	IV.	V.		
NBB	III. .08.11.2006.	50		50	-	-	-	-	-	0
NBV I.	III. .08.11.2006.	20		20	-	-	-	-	-	0
NBV II.	I. 11.06.2004.	50		47	1	2	-	-	2,66	6
NBV II.	II. 15.11.2005..	50		44	3	3	-	-	2,50	12
NBV II.	III. .08.11.2006.	50		43	2	5	-	-	2,71	14
NBV III.	III. .08.11.2006.	25		25	-	-	-	-	-	0
NBK	III. .08.11.2006.	50		50	-	-	-	-	-	0
NBF	I. 11.06.2004.	20		18	1	1	-	-	2,50	4
NBF	II. 15.11.2005..	20		18	-	2	-	-	3,00	4
NBF	III. .08.11.2006.	20		18	-	1	1	-	3,50	4
NBT	I. 11.06.2004.	50		40	3	5	2	-	2,90	20
NBT	II. 15.11.2005..	50		38	4	6	2	-	2,83	24
NBT	III. .08.11.2006.	50		35	4	7	3	1	3,07	30

Remarks to Table 3-4:

NBB – Baia Mare Borpatak,
NBV – Baia Mare Veresvíz,
NBK – Baia Mare Kőbánya,
NBF – Baia Mare Felsőtótfalu,
NBT – Baia Mare Tauti Magherau,

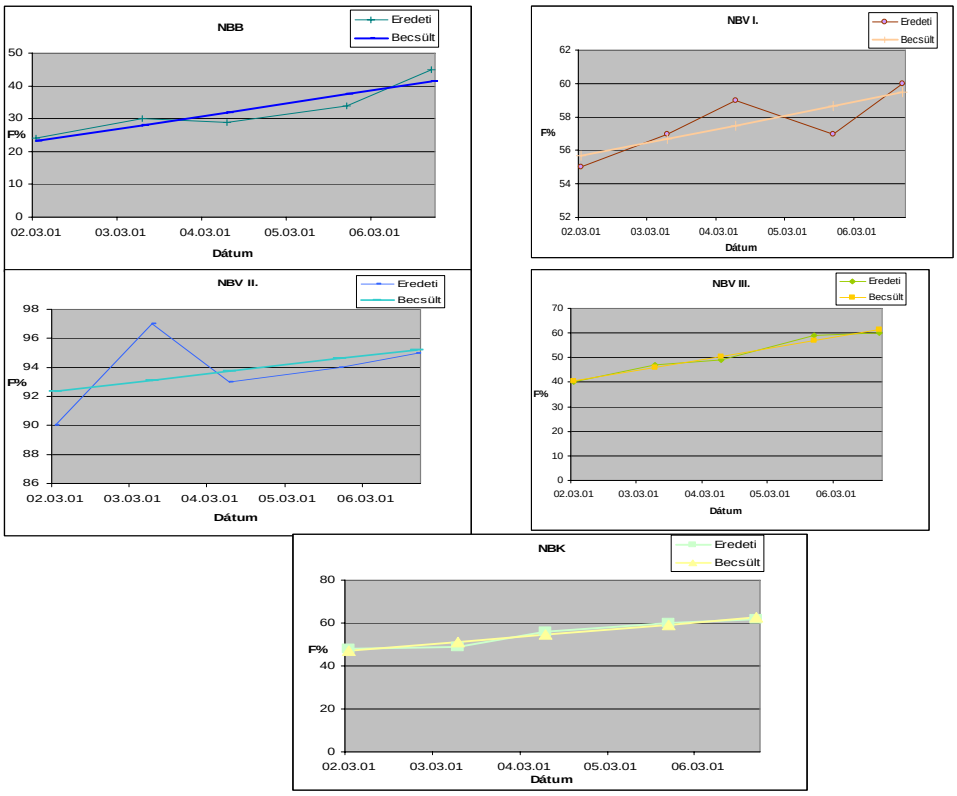

Fig. 7: Trend analysys of infection ratio (I%) on the examined test sites near Baia Mare

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