

Health conditions of *Castanea sativa* Mill., incidence of the fungus *Cryphonectria parasitica* (Murr) Barr. and possibilities of its biological control in Slovakia

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1. Introduction

In the Arboretum Mlyniany – Institute of Dendrobiology the health of Spanish chestnut (*Castanea sativa* Mill.) has been evaluated since 1965. Fungi significant from the economic point of view have been observed on assimilative organs, roots, stems and branches.

On leaves the conidial stage of the fungus *Mycosphaerella maculiformis* (Pers.) Schroet., the fungus *Cylindrosporium castaneae* (Dessm.) Mont. causes spots of various sizes and shapes. Slight flour-like coating is caused by the fungus *Microspora alphitoides* Griff et Maubl.

Spanish chestnut stands are often damaged by the fungi *Phytophthora cambivora* (Petri) Buism. and *Ph. cinnamomi* Rands. which cause the roots and stem base to necrotize. As a consequence of their parasitism young and even several hundred-year-old trees have died in Slovakia.

Less significant in our conditions are the fungi *Valsa intermedia* Nitsche with its conidial stage *Cytospora intermedia* Sacc. and *Pseudovalsa modonia* (Tul.) Kobayashi. Open cancer wounds on branches and young stems are caused by the fungus *Phomopsis castaneae* Woronich.

Chestnut blight caused by *Cryphonectria parasitica* (Murr.) Barr belongs to the most significant and most serious diseases of this woody plant both in the natural range and in places of cultivation.

2. Materials and methods

The basic method applied in the procedure was the location of the zones of incidence of the fungus *Cryphonectria parasitica* on 140 sites of Spanish chestnut (*Castanea sativa* Mill.) in Slovakia.

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From the sites where attacked trees had been found isolates were obtained from the mycelium, pycnidia, and pycnospores and brought to the laboratory. We used agar media for cultivation (1-3% water agar, 1-3% maltose agar, 1-3% Czapek-Dox agar, 3% Czapek-Dox agar containing maltose). In France 1% concentration of maltose was used. Our eight virulent strains were compared with 10 hypovirulent strains from the French collection of fungi.

3. Results

Within the years 1990-1992 the incidence of the fungus *Cryphonectria parasitica* in Slovakia was monitored (1) on Spanish chestnut and oaks.

We found that the fungus occurs in the following sites: Bratislava, Myslenice, Pezinok, Modra, Radošina, Prašice, Podhradie, Stredné Plachtince, Horné Plachtince.

From each site of infection isolates were obtained. We have found that the optimum cultivation temperature was about 24°C, and pH was 6,3-6,6. In all isolates orange-red heaps with pycnospores were formed. In the course of cultivation, which lasted 340 hours, the number of pycnidial beds ranged from 110 to 150 pcs. Each bed contained several thousands of germinating conidia. On the basis of the evaluation of the morphological features of our strains of the fungus we may say that all of them are virulent. Not a single one had the features of hypovirulent strains.

These results were also confirmed at the Station d'Agronomie et Mycologie - Unité de Mycologie in Clermont Ferrande, France.

TABLE 1
CONFRONTATION OF THE FUNGUS *CRYPHONECTRIA PARASITICA* STRAINS FROM CZECHO-SLOVAKIA

| Strain number | 7 | 9 | 10 | 11 | 32 | 39 | 92 | 93 |
|---------------|---|---|----|----|----|----|----|----|
| 7 | | | | | | | | |
| 9 | - | | | | | | | |
| 10 | - | + | | | | | | |
| 11 | - | + | + | | | | | |
| 32 | + | - | - | - | | | | |
| 39 | - | + | + | + | - | | | |
| 92 | - | + | + | + | - | - | | |
| 93 | + | - | - | - | + | - | | |

+ = compatible strains from CV group

- = incompatible strains of different CV groups

TABLE 2
CONFRONTATION WITH HYPOVIRULENT STRAINS

| Strain H | CV I | | CV II | |
|----------|------|-----|-------|----|
| | 32 | 7 | 9 | 10 |
| 2022 | — | — | — | — |
| 2029 | — | — | — | — |
| 2079 | — | — | — | — |
| 2099 | — | — | — | — |
| 2100 | +1 | + | — | +P |
| 2103 | — | — | — | +P |
| 2104 | — | ++P | — | + |
| 2106 | +— | — | +P | — |
| 2113 | — | — | — | — |
| 2073 | — | — | — | — |

+ = full contamination by virulent strains

+P = partial contamination by virulent strains

TABLE 3
COMPARISON OF NEW STRAINS WITH VIRULENT STRAINS

| Group CV I | | | | | | |
|-------------|--------------|----|--------|------|--------|--------|
| V strain | New H strain | | C | | E | |
| | 7 | 32 | + | 2104 | 32 | + 2106 |
| 7 | + | + | + | + | + | + |
| 32 | + | + | + | + | + | + |
| 93 | + | + | + | + | + | + |
| Group CV II | | | | | | |
| V strain | H strain | | A | | B | |
| | 10 | 9 | + 2103 | 10 | + 2104 | + 2106 |
| 9 | + | + | + | + | + | + |
| 10 | + | + | + | + | + | + |
| 11 | + | + | + | + | + | + |
| 39 | + | + | 1 | + | + | + |
| 92 | + | + | + | + | + | + |

In every case contamination is good by virulent strains.

Eight strains isolated from sites in Slovakia were tested. After being compared they were divided into 2 groups (tab. 1) and confronted with ten hypovirulent stains from the French collection (tab. 2). It was found that 3 of hypovirulent strains are compatible with strains from the CV I group and 5 strains were compatible with strains from the CV II group as given in tab. 3.

On the basis of these results, forceful hypovirulent strains will be prepared in France to be applied to the Spanish chestnut trees in Slovakia.

Apart from Spanish chestnut, the fungus *Cryphonectria parasitica* also invades a wide range of host plants, including oaks in Slovakia. Strains isolated from oaks are less aggressive than those isolated from chestnuts.

Biological control using hypovirulence is very efficient and we hope that thanks to its application Spanish chestnut trees in Czecho-Slovakia will be preserved for future generations.

Literature

1. Juhásova G., Hrubík P., Leontovyc R., (1992), *Folia Dendrobiologica*, 21.

Stan zdrowotny *Castaneae sativa* Mill., porażonych przez grzyba *Cryphonectria parasitica* (Murr.) Barr. i możliwość jego biologicznego zwalczania na Słowacji

Streszczenie

W pracy przedstawiono stan zdrowotny kasztana jadalnego (*Castaneae sativa*) na Słowacji. W latach 1965-1992 z chorych drzew wyizolowano znaczące patogeny grzybowe i tak z organów asymilacyjnych: *M. maculiformis*, *C. castaneae*, *M. castaneae*, a z pni i gałęzi: *C. parasitica* syn. *E. parasitica*, *V. intermedia*, *C. intermedia*, *P. modontium* i *P. castaneae*.

Szczególne znaczenie ma grzyb *Cryphonectria parasitica*, który wykryto w Czecho-Słowacji po raz pierwszy w 1976 roku, a który od tego czasu spowodował duże zniszczenie drzew rosnących w ośmiu drzewostanach kasztanowych. Mechaniczne metody zwalczania grzyba zostały zastosowane w celu ograniczenia ognisk infekcji. W 1992 roku metody biologicznej ochrony zostały wprowadzone przy zastosowaniu metody hipowirulencji przy użyciu hipowirulencyjnych szczepów grzyba otrzymanych z Francji.

W pracy przedstawiono wyniki dotyczące stopnia porażenia i rozprzestrzeniania się grzyba, niektóre problemy dotyczące biologii choroby oraz wyniki uzyskane nad sprawdzeniem nowych wirulencyjnych szczepów z hipowirulentnymi szczepami grzyba otrzymanymi z Francji.

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