Environment-friendly control measure methods

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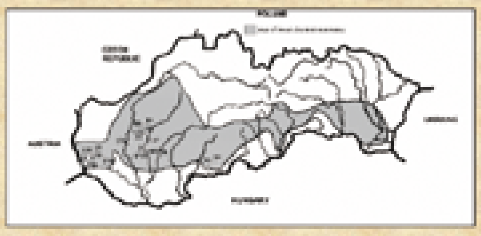
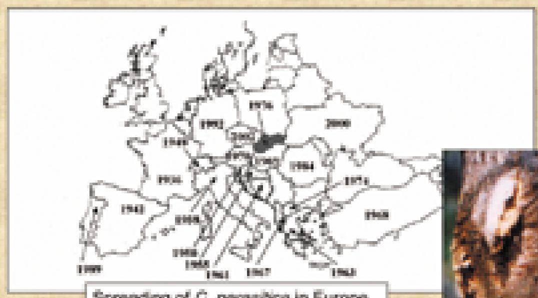


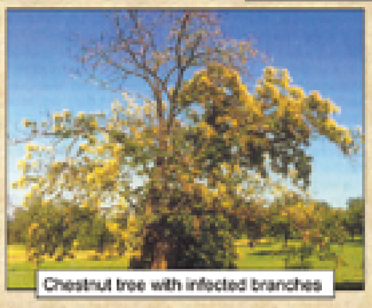
Localities with *C. parasitica* occurence in Slovakia



Spreading of *C. parasitica* in Europe

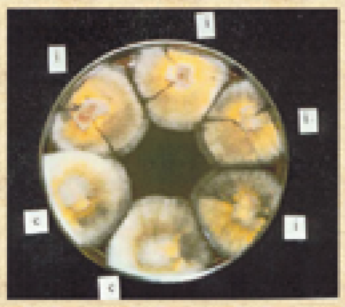
Biological control of Chestnut blight

Chestnut blight, or chestnut bark disease, is caused by an introduced fungus, *Cryphonectria parasitica* (Murrill) Barr, (formerly *Endothia parasitica* [Murrill] Anderson & Anderson).
C. parasitica was introduced into North America from the Far East at the end of the nineteenth century and spread within the next five decades throughout all the main American chestnut areas. In 1938, the pathogen was first discovered on European chestnut in Europe as an isolated focus near Genova, Italy. First occurence in Slovakia was detected in 1976. The blight appears to have been introduced from either China or Japan. Japanese and some Chinese chestnut trees are resistant to the fungus: they may be infected, but the blight does not usually kill them.



Chestnut tree with infected branches

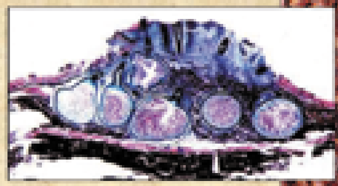
Canker on stem



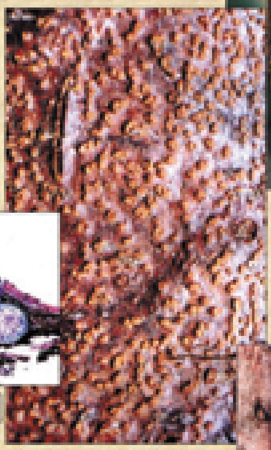
Testing of vegetative compatibility groups c-compatible, resp. i-incompatible strains

Negative conversion between virulent (orange) and hypovirulent (white) incompatible strains

Chestnut blight is a canker disease. Cankers may enlarge so rapidly that the stem becomes girdled without callus formation. Regions above the point of invasion die; the leaves wilt and turn brown but remain hanging on the tree. On young, smooth-barked branches, blight-infected patches are bright brown, in contrast to the olive-green colour of normal bark. On older stem infections, the discoloration is less obvious. Host infection occurs when fresh wounds in the bark become infected with spores that are disseminated by wind, birds, rain, and insects. The fungus can exist as a saprobe on broad-leaved trees beyond its parasitic host range. Fan-shaped, buff-coloured mycelial wefts form in the inner bark and cambium. Reddish perithecia are produced in groups. Long, coiled tendrils of conidia exude from pycnidia in wet weather.



Several peritecia in stroma



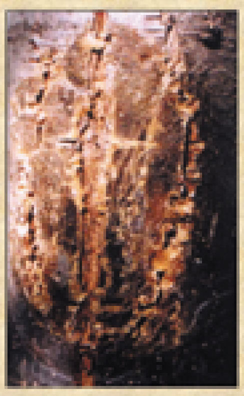
Reddish peritecia on bark

Pycnidia filled with pycnospores

Pale-brown mycelial fans in the inner bark

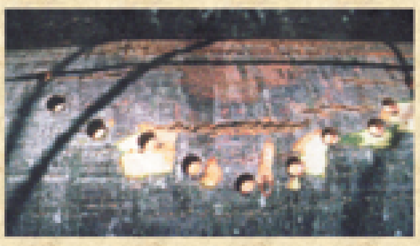
Successful conversion of virulent with compatible hypovirulent strain

Pellets containing hypovirulent mycelium



Healing lesion after treatment

Inoculum paint over with tree balsam



Pellets are placed into drilled holes around lesion

Cryphonectria parasitica occurs in nature in two forms: virulent and hypovirulent. These strains have different physiological and morphological properties. Hypovirulent isolates are discoloured (paler orange mycelia in cultures), practically without reproduction organs (lowered sporulation), and with significantly lesser virulence to *Castanea sativa*, compared to the virulent isolates. They have a piece of double-stranded RNA (a virus in the family Hypoviridae), which doesn't normally occur in fungi and essentially causes a disease in the fungus, making it less virulent. Hypovirulence can be transmitted by hyphal anastomosis to virulent strains of the same vegetative compatibility group. The use of hypovirulent strains offers some prospect for control. The application of a hypovirulent strain around developing lesions may enable these lesions to recover and can convert the virulent strain into a hypovirulent strain.

Control of Horse-chestnut leaf miner with tree injection

Microinjection is a type of trunk injection where small amounts of therapeutic chemicals (antibiotics, fungicides, insecticides and mineral nutrients), contained in sealed capsules, are introduced into shallow trunk wounds around the base of a tree. The injected chemicals are then distributed systemically by sap movement within the tree to the branches, leaves and even roots, within a few hours after injection. This treatment is generally most effective on chewing and sucking insects that feed on young shoots and leaves. Depending on how quickly the insecticide breaks down in the tree, it may continue to be effective in controlling pests in the leaves and shoots for several weeks or even through the entire growing season. We tried to use microinjection technology to solve the problem with Horse-chestnut leaf miner (*Cameraria ohridella* Deschka&Dimić.

Adult moth

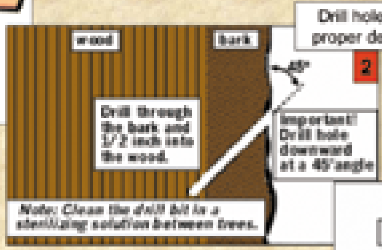
Larva

Symptoms of damage are easy distinguishable. Larval stages of the insect destroy leaf parenchyma due to reduction of assimilation and premature shedding of leaves.

Pupa

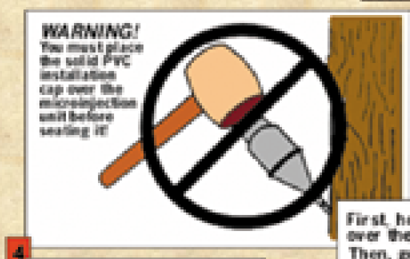
Young mines on leaf

Control measures include the aerial spraying of diflobenzorun, the injection of systemic insecticides and the removal of dead leaves, in witch pupae overwinter. Classical biological control against *C. ohridella* shows potential, but also major constraints, the two main ones being the fact that the origin of the moth remains unknown, and the low number of specific species among the natural enemy complex of Gracillariidae. The presence of more diversified native parasitoids and hyperparasitoids from the Ichneumonoidea in Slovakia predicate a slow successive adaptation of the parasitoid fauna to the invasive host.

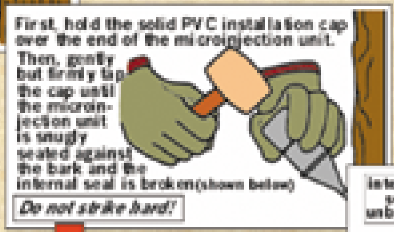


Drill hole to proper depth

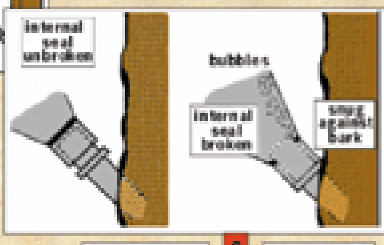
3 Insert microinjection unit



4 Do not strike microinjection unit directly!



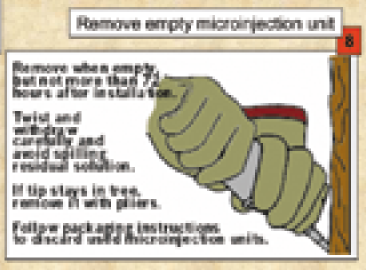
5 Seat microinjection unit

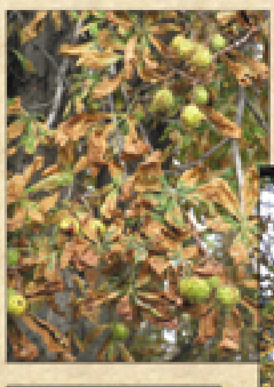


Before seating 6 After seating

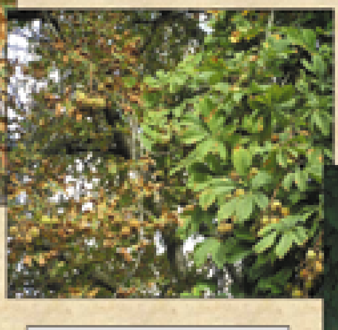
7 Pressurize microinjection unit

Remove empty microinjection unit





Damage of untreated leaves on Horse-chestnut



Difference between treated (right) and untreated tree (left)

Leaves are free of mines during all growing season after tree injection

Microinjection is environmentally friendly way to apply pesticides. No need to worry about drift, because of the patented closed system this means the chemical is contained entirely within the tree. Only pests feeding on the tree are directly affected. Beneficial and non-target insects and other life forms are not affected. This gives the applicator the opportunity to treat trees in adverse weather conditions (wind and rain) or at location (next to swimming pools, in school yards, along busy streets, in interior plantscapes etc.

Injector with insecticide on base of tree

Due to technological shortage of spraying technologies in urban greenery we tried to solve the problem with horse chestnut leaf miner using microinjection technology used originally in USA. The aim of our investigation was evaluated efficiency of VIVID II (Tree Tech – Microinjection Systems) insecticide (active compound is 2% abamectin). This insecticide is the natural ferment of soil bacterium *Streptomyces avermitilis* discovered in Japan. In 2005 were used 900 injectors to control of 71 host trees in 6 localities. Efficiency of control measures ranged from 84,7 to 99,0%. In 2006 were treated 197 trees in 10 localities and the efficiency ranged from 86,4 to 99,9%.

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