# *Chondrostereum purpureum* a potential biocontrol agent of sprouting

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## Abstract

In August – October 2003 three biological control experiments were established near Hyytiälä Forestry Field Station of Helsinki University in southern Finland. Water suspension of mycelia of the basidiomycete *Chondrostereum purpureum* was inoculated on stumps just after felling in order to examine the impact of inoculation on tree sprouting. The cut trees were 6–10 years old birch, aspen, willow, rowan or alder. Two plots located in sapling stand and one plot located under an electric power line. In October 2004 the occurrence of sporophores of *C. purpureum* were assessed from the stumps, while the sprouts were counted and measured in August 2005.

Sporophores of *C. purpureum* were found in 24.8 % of inoculated stumps and in 5.0 % of control stumps. This fungus is common in nature and the infections in controls were probably natural. Also dead sprouts were observed, but they were found both in controls and in inoculated stumps. The length of the longest sprout in stump was almost the same in both treatments. The used control methods did not stop sprouting. Three different fungus strains were inoculated in experiment. One of them was the Biochon preparation developed in Netherlands. It seems that in northern conditions more knowledge is needed for developing an effective biocontrol method of sprouting.

## Introduction

*Chondrostereum purpureum* (Fr.) Pouz. has been tested as biocontrol agent of sprouting in Netherlands (De Jong & Scheepens 1982) and Canada (Wall 1990, Pitt *et al.* 1999, Harper *et al.* 1999, Becker *et al.* 1999). It is a wound decay fungus on broadleaved trees and also a pathogen causing silver-leaf disease. In Scandinavia the fungus is common on birch. It infects stumps, cutting waste, timber and wounds in growing trees.

The infection biology of *C. purpureum* on stumps has been studied in New Zeeland (Spiers and Hopcroft 1988). They found that a mycelial inoculum causes bigger lesions than a basidiospore inoculum in Salix. Also the fungus grows better in fresh wounds than old wounds. *C. purpureum* is an out-crossing fungus, and a heterokaryotic condition of mycelia can be checked by the presence of clamp connections, which are not formed in monospore culture.

Two commercial preparations of *C. purpureum* have been developed, Biochon in Netherlands and Myco-Tech$^{TM}$ in Canada. The test results of these have been promising and for example Myco-Tech$^{TM}$ is given 70–100 % efficiency according to commercial information.

The aim of this work was to test preliminarily the efficiency of *Chondrostereum purpureum* as biocontrol agent of sprouting in boreal forest.

## Material and Methods

The field experiments were established in southern Finland at Ruovesi and Orivesi locating in surroundings of Hyytiälä Forestry Field Station. Three experiments were established in autumn 2003 (Fig. 1). The young trees were felled with brush cutter/clear cut saw in 10x10 m plots and the stumps were painted immediately with inoculum. In control plots the stumps were open for natural inoculation without treatments. Two experiments were located in spruce sapling stand and one experiment under an electric line. The age of felled trees was 6–10 years.


*Fig. 1. Experimental design.*

Three fungal strains were used; Biochon, Orivesi and 2.65. The Biochon is a commercial preparation from Netherlands, the Orivesi strain was isolated from a birch stump without sprouts, and the strain 2.65 originated from FFRI collections and has been isolated by Anna-Maija Hallaksela.

The appearing of sporophores in stumps was inventoried in October 2004. The sprouts were counted and measured in August 2005.

## Results

*Chondrostereum purpureum* inoculations increased clearly the sporophore production in stumps (Fig. 2). In inoculated birch stumps the sporophore frequency varied between

27–43 % in August –October inoculations. In control stumps the sporophore frequency was 5 % (Table 1). Sporophores were found also in alder, rowan, aspen and willows.

*Fig. 2. Sporophores of* Chondrostereum purpureum *on birch stump. Birch stump was inoculated in May and the photo was taken in October. Photo: Henna Penttinen*

Table 1. The percent of birch stumps with sporophores one year after inoculation.

| Inoculation time | Sporophores, % |
|---|---|
| August 2003 | 43 % |
| September 2003 | 34 % |
| October 2003 | 27 % |

Table 2. Number of sprouts, number of dead sprouts and length of the longest sprout in three experimental sites. Treatments; inoculation and control.

| Plot | Sprouts/ stump | Dead sprouts | Length of the longest sprout, cm |
|---|---|---|---|
| Ruovesi 1 inoc. | 3.47 | 1.22 | 76 |
| Ruovesi 1 control | 4.19 | 0.75 | 90 |
| Ruovesi 2 inoc. | 1.5 | 0.4 | 83 |
| Ruovesi 2 control | 2.0 | 0.69 | 109 |
| Orivesi inoc. | 2.59 | 0.87 | 137 |
| Orivesi control | 2.63 | 0.69 | 130 |

The depth of fungus growth was not systematically measured. At least in the few cut stumps examined it seemed that the whole stump was decayed, but no isolations were made.

The inoculation in this experiment did not stop sprouting during the first two years (Table 2). It could have a mild effect, but not enough for commercial purposes. Some sprouts were dying during the second season, but dying sprouts were observed also in control plots.

## Discussion

This experiment shows the possible light effect of biocontrol treatment with *C. purpureum* on sprouting, but probably a longer incubation time is needed to verify the now presented data. For developing of a more effective control method with *Chondrostereum purpureum*, there are still several possibilities. The sporophore frequency was not 100 % in this experiment, which raises suspicion that the used inoculation method was not the best one. At least the Biochon preparation was contaminated with bacteria. Anyway, Biochon produced sporophores clearly more than controls.

In this experiment the inoculations were made from August to October. It seemed that the production of sporophores was decreasing along with delayed inoculation time. So testing also other inoculation times could be important.

Three strains of *C. purpureum* were now used in this experiment. Pitt *et al.* (1999) concluded that the fungal isolate used could be an important source behind variation in treatment efficiency. The screening of a large number of isolates would seem necessary to find the most suitable fungal strains for biocontrol of sprouting. The process how *Chondrostereum purpureum* is stopping the sprouting is not known very well either and the roles of e.g. fungal enzymes and toxins should be examined.

## References


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