THE INFLUENCE OF *TRICHODERMA* SPP. RELEASED WATER-SOLUBLE COMPOUNDS ON *HETEROBASIDION ANNOSUM* S.L. IN LABORATORY CONDITIONS

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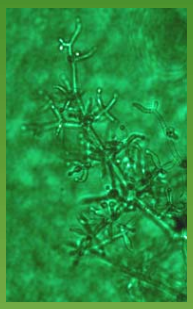
INTRODUCTION

Inhibitory effect of water-soluble compounds from six *Trichoderma* spp. strains were evaluated in laboratory conditions against three isolates of *Heterobasidion annosum* s.s. and four isolates of *H. parviporum* in malt extract agar medium.



MATERIALS AND METHODS

Inhibitory effect of water-soluble compounds released by six *Trichoderma* spp. strains on *Heterobasidion annosum* (three strains) and *H. parviporum* (four strains), isolated in Latvia, was estimated (Table 1).
The growth of *Heterobasidion annosum* s.l. was examined on malt extract agar (Becton Dickinson, USA) with 10% of *Trichoderma* medium filtrate. Two repetitions of *Heterobasidion* strains and control versions were incubated at temperature of 15 °C and 20 °C for two weeks in darkness. Radial growth of *Heterobasidion* was measured every tree days.

RESULTS AND DISCUSSION

All of the investigated *Trichoderma* spp. filtrates showed an inhibitory effect on all *Heterobasidion annosum* s.l. strains growing at both temperatures (15 °C and 21 °C). Visually comparing *Trichoderma* spp. filtrate with the control version, *Heterobasidion* colonies were growing much shorter and more compact (Fig. 1).

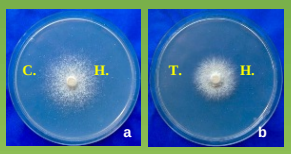


Figure 1. Mycelium of *H. annosum* (H.) strain 981 after a week cultivation at 21 °C. a: Control (C.), b: with T. 945 filtrate (T.).

After 11 days of incubation at 15 °C, *T. viride* 945 water-soluble compounds were the most effective in comparison with other strains, against five *Heterobasidion* strains – H.532 (50%), H.981 (25%), H.1020 (67%), H.1021 (63%) and H. 1023 (56%). Both *Trichoderma* strains, 472 and 1026 showed the highest inhibition on growth of H.980 (38%) and H.1022 (45%) (Fig. 2).

After eight days of incubation at 21 °C, *T. viride* 585 filtrate was most effective against *H. parviporum* strain 1023 (24%). *T. viridescens* 945 soluble substances had the most effect on four *Heterobasidion* strains - H.532 (65%), H.981 (26%), H.1020 (65%) and H.1021 (54%). *T. viride* 1026 had the highest inhibitory effect against two pathogenic strains - H.980 (16%) and H.1022 (32%). Even if T.946 showed the lowest inhibition efficiency (-2%) on H.1022, the inhibition of pathogen growth was 6% at the end of the experiment (Fig. 3).

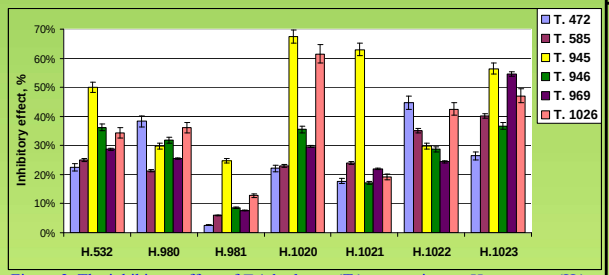


Figure 2. The inhibitory effect of *Trichoderma* (T.) suspension on *H. annosum* (H.) s.l. and *Phlebiopsis gigantea* 702 (P.) growth, cultivated 11 days at 15 °C temperature.

Table 1. *Trichoderma* spp. and *Heterobasidion annosum* s.l. isolates used in this study

Number in MSCL	Species	Substrate of isolation	Country of origin
472	*T. viridescens*	Rhododendron	Latvia
585	*T. viride*	Historical masonry	Latvia
945	*T. viride*	wall	Latvia
946	*T. viride*	Soil	Latvia
969	*T. viride*	Soil	Latvia
1026	*T. viride*	Soil	Latvia
532	*H. annosum*	*Alnus incana*, stem	Latvia
980	*H. parviporum*	*Pinus sylvestris*, root	Latvia
981	*H. parviporum*	*Pinus sylvestris*, root	Latvia
1020	*H. parviporum*	*Pinus sylvestris*	Latvia
1021	*H. parviporum*	*Pinus sylvestris*	Latvia
1022	*H. annosum*	*Pinus sylvestris*	Latvia
1023	*H. annosum*	*Picea abies*, stem	Latvia
	H. parviporum	*Picea abies*	
	H. parviporum		

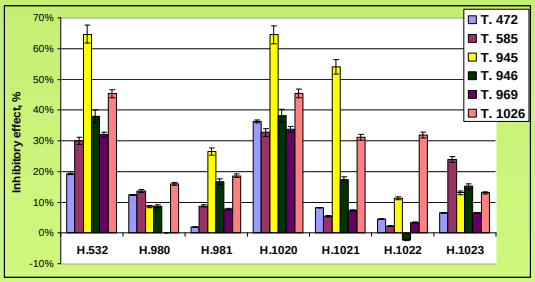


Figure 3. The inhibitory effect of *Trichoderma* (T.) filtrate on *H. annosum* (H.) s.l. growth, cultivated eight days at 21 °C temperature.

Trichoderma spp. water-soluble metabolites were comparatively less effective at 21 °C than at 15 °C. Overall the inhibitory effect on *H. annosum* s.l. decreased when incubation period was increasing. Only T.945 filtrate inhibitory effect at 15 °C increased with each day of the cultivation, suggesting to have a very strong water-soluble influence on *Heterobasidion* growth (Table 2).

Table 2. The average inhibitory effect (%) of *Trichoderma* spp. (T.) on seven *H. annosum* s.l. strains growth, cultivated at 15 °C and 21 °C temperature.

Number in MSCL	15 °C				21 °C				- X
	6 d.	8 d.	11 d.	- X	6 d.	8 d.	11 d.	- X	
T. 472	36	35	25	32	26	13	8	15	24
T. 585	31	30	25	29	21	17	9	15	22
T. 945	36	42	46	41	37	35	34	35	38
T. 946	31	30	28	30	18	19	16	17	23
T. 969	37	33	28	33	18	13	3	11	22
T. 1026	40	36	36	37	26	29	21	25	31

CONCLUSIONS

- The results show that all *Trichoderma* strains were releasing in the medium water-soluble compounds with antagonistic effect on the radial growth rate of *Heterobasidion*. There were significant differences in inhibitory effect size of various strains. The inhibition was more pronounced at 15 °C than at 20 °C.
- Media filtrates from *T. viride* strains MSCL 945 and MSCL 1026 were the most active inhibitors.
- *H. annosum* strain MSCL 981 was the strongest of all studied *Heterobasidion* spp. strains against *Trichoderma* spp. media filtrates.

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This study was supported by the European Regional Development Fund (ERDF) (project Nr. 2010/0277/2DP/2.1.1.1.0/APIA/VIAA/129).