Use of Chitin as Soil Amendment against *Pyrenochaeta lycopersici*

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Abstract

The severity of infection of tomato plants (cv. De Berao) by Pyrenochaeta lycopersici causing corky root disease was reduced by application of chitin (Biosol) as soil amendment in greenhouse-pot experiments. Compared to untreated control plants showing extensive root rot or plants grown in steamed soil, plants treated with chitin showed limited root rot and reached 62% of the average fresh weight of plants grown in steamed soil.

Introduction and Purpose

The infection of soils with pathogenic fungi is often only detected when the inoculum density and therefore the infection pressure have already exceeded problematic limits and plants show symptomatic signs. This applies in particular to *Pyrenochaeta lycopersici*, the pathogen of the corky root disease of tomatoes. As a rule, Switzerland has no promising chemical agents at its disposal for the control of this pathogen under greenhouse and field conditions, therefore control strategies on a biological basis have to be developed. The effects of using chitin in the form of Biosol as soil amendment on the infection pressure of *Pyrenochaeta lycopersici* in tomato plants was examined in pot experiments under greenhouse conditions.

Methods

For the pot experiment, soil from a grower was used that was contaminated with *Pyrenochaeta lycopersici* with 30 percent by volume of fresh Seramis-Blähton (expanded clay) added. The following procedures were used: 1. untreated soil (control), 2. pasteurized soil heated to 90 °C, 3. soil mixed with 2 % (weight) Biosol. For every 14 cm pot, 3 tomato seeds (cv. De Berao) were sown and 2 seedlings were removed after emergence of the plants. For every procedure, 5 pots each containing 1 plant were used for the experiment. The plants were grown in a greenhouse cabin at the climatic conditions that are customary for tomatoes over a period of 16 weeks and treated with mineral fertilizer. The above-ground plant parts were cut and weighed for the evaluation. The roots were washed, weighed, and examined for infestation with *P. lycopersici*.

Results and Discussion

Figure 1 shows that the steamed soil produced the highest plant yield. The untreated soil that was infested with *P. lycopersici* achieved only stunted growth of the tomato plants due to intensive rot that considerably reduced the root mass (Figure 2). The application of chitin in the form of Agrobiosol resulted in an average plant mass corresponding to approximately 62 % of the mass of the plants grown on steamed soil.

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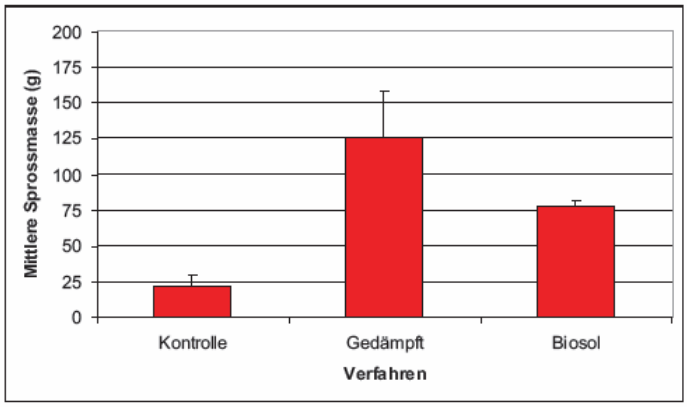

Figure 1: Effect of soil amendment with chitin on the average shoot mass of 5 tomato plants as compared to untreated and steamed soils (error indicator = standard deviation)

Legend:
Mittlere Sprossmasse = average shoot mass
Kontrolle = control
Gedämpft = steamed
Verfahren = procedure

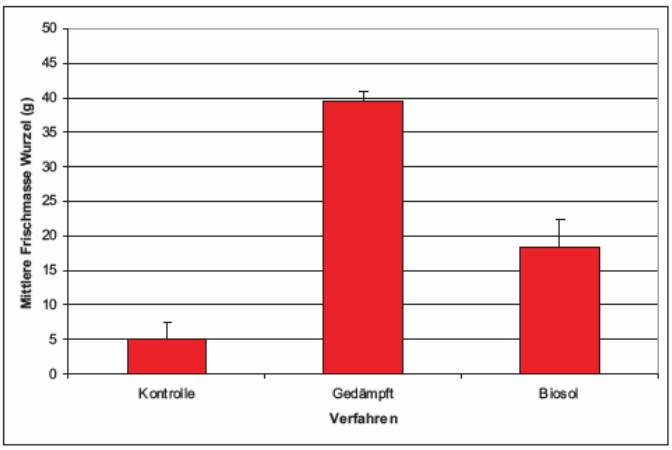

Figure 2: Effect of soil amendment with chitin on the average root mass of 5 tomato plants as compared to untreated and steamed soils (error indicator = standard deviation)

Legend:
Mittlere Frischmasse Wurzel = average fresh weight of roots

The improvement of the root health of the plants treated with Biosol-chitin that resulted in a higher plant yield can be attributed to biological processes in the soil. The chitin-degrading microflora contained in every soil was stimulated to increased activity by the massive supply of the natural substance chitin, which also involved the chitin of the inoculum of *P. lycopersici* in the soil and resulted in a reduction of the infection pressure of the parasite. This experience was confirmed by a long-term application trial carried out with Biosol to control the cabbage club-root of field-grown plants (Heller et al. 2007).

Literature

Heller W.E., Neuweiler R., Krauss J. (2007): Erste Erfahrungen mit dem Einsatz von Chitin gegen die Kohlhernie. Der Gemüsebau 6/2007: 15-17
(first experiences with the use of chitin to control cabbage club-root).