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CONTROL OF SOILBORNE PATHOGENS ON VEGETABLES BY MICROORGANISMS ISOLATED FROM COMPOST AND BY MICROBIAL-FORTIFIED COMPOST

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Soilborne pathogens can cause serious damages to economically important crops in Italy and new strategies are requested for their control. The objectives of the present work were to investigate the effectiveness of microorganisms isolated from composts and of compost fortified with biological control agents to control soilborne pathogens on vegetables.

A municipal compost showing a good suppressive activity was used as source of microorganisms. The same compost was also steamed and compared to non steamed. Both of them were inoculated with commercially available *Trichoderma* and with non-pathogenic *Fusarium* at 1, 2 and 4 g/l. A commercial peat substrate was used as control. The colonies isolated were tested in greenhouse against *Fusarium oxysporum* f. sp. *basilici*/basil, *Phytophthora nicotianae*/tomato (Fig. 1), *Pythium ultimum*/cucumber and *Rhizoctonia solani*/bean. In the case of fortified compost, the tests were carried out also on the pathosystem *Fusarium oxysporum* f.sp. *lactucae*/lettuce. Diseased plants were counted weekly after transplanting and above-ground biomass of plants was measured at the end of the trials.

Figure 1: Trial for testing microorganisms isolated from compost against *Phytophthora nicotianae* on tomato under greenhouse conditions.

Table 1: Activity of the best microorganisms isolated from compost against three soil-borne pathogens.

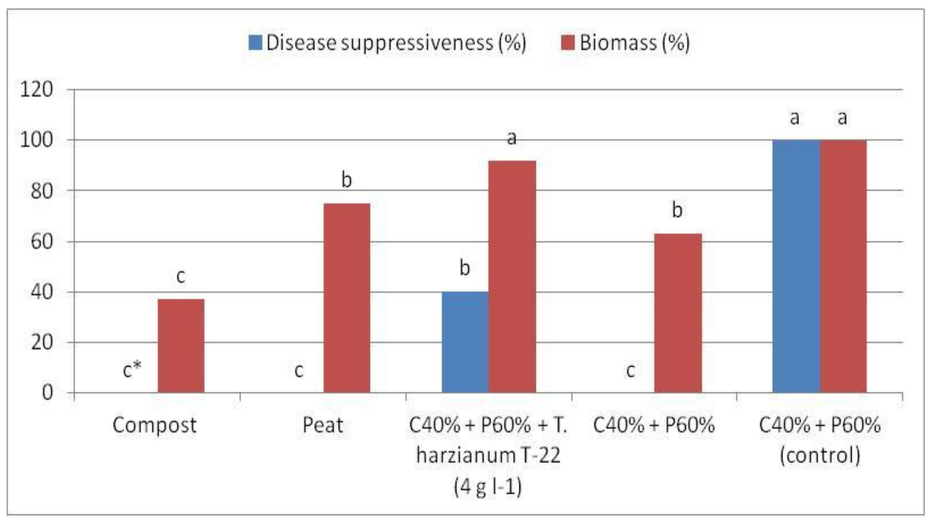
Microorganism	Pathogen	% disease control		
		F. oxysporum f. sp. *basilici*/ basil	*Phytophthora nicotianae*/ tomato	*Rhizoctonia solani*/ bean
K5	Yes	69 ab*	28 bc	13 cd
K6	Yes	56 abc	0 c	15 cd
K7	Yes	64 ab	0 c	22 bc
E12	Yes	0 c	25 bc	14 cd
E15	Yes	0 c	31 bc	1 d
E19	Yes	10 bc	0 c	49 b
B3	Yes	16 bc	73 a	11 cd
B17	Yes	10 bc	82 a	29 bc
-	Yes	0 c	0 c	0 d
-	No	100 a	100 a	100 a

* Tukey's HSD test ($P < 0.05$)

Among the microorganisms isolated from suppressive compost, 28 showed a significant disease reduction of at least one of the pathogens tested, but none of the microorganisms was able to control all the pathogens in greenhouse trials (Tab. 1). In particular it was very difficult to control *Rhizoctonia solani*

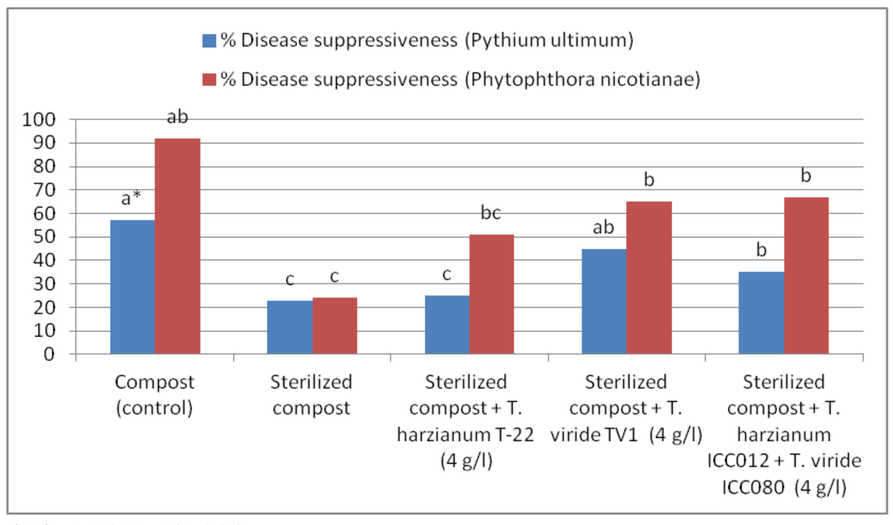
Compost suppressiveness was partially restored when compost was steam sterilized and biological control agents were applied at least at 2 g/l dosage.

Figure 2: Effect of the addition of *T. harzianum* strain T-22 at 4 g/l on compost against *R. solani* on bean.



*Tukey's HSD test (P<0,05)

Figure 3: Effect of the addition of *T. harzianum* strain T-22 at 4 g/l on compost against *P. ultimum* and *P. nicotianae.*



*Tukey's HSD test (P<0,05)

The addition of *T. harzianum* strain T-22 at 4 g/l dosage was able to increase suppressiveness against *R. solani* of a 40% compost and 60% peat mix and to increase biomass of bean compared to a peat inoculated control (Fig. 2).
Disease suppressiveness of sterilized compost was restored by the addition of *T. viride* strain TV1 at 4 g/l in *P. ultimum*/cucumber and in *P. nicotianae*/tomato (Fig. 3). The non-pathogenic *Fusarium* strain IF23 at 4 g/l dosage controlled *F. oxysporum* f. sp. *lactucae*.

In conclusion, our results indicate that the selection of antagonists from suppressive composts and the addition of specific antagonists to compost represent new opportunities in disease management.