

## An Experimental Approach in Controlled Conditions for Understanding Biofumigation Effects at the Succession Scale on *Rhizoctonia solani* Expression on Carrots

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Soil-borne diseases are of major concern in field vegetables production, and their management is still strongly dependent on chemical soil fumigants. To build integrated crop strategies, the crop succession scale offers opportunities of inter-crops management between two commercial crops. Particularly, there is now an increasing interest in biofumigation, which consists in growing some *Brassicaceae* species, then crushing them at flowering stage and incorporating them into soil. First, an *in vitro* experiment is conducted to compare the toxicity of volatile compounds contained in crushed above-ground parts of two *Brassica juncea* lines, highly different in their glucosinolates profiles, on various soil-borne fungi: two pathogenic species (*Pythium sulcatum* and *Rhizoctonia solani*), and one antagonistic species (*Trichoderma atroviride*). Besides, a one-year succession 'inter-crop period – carrot crop –inter-crop period – carrot crop' is carried out in large containers, with biofumigation by these 2 lines of mustard conducted during inter-crop period and compared to bare soil. Effects induced on *R. solani* AG2-2 by biofumigation, in soil amended or not by *T atroviride*, are assessed by means of soil inoculum potential experiments, pathogen-ADN quantification and, finally, assessments of incidence and severity of disease on mature carrots. Differences in toxicity *in vitro* are attributed to the level of sinigrin of the studied lines; among the fungi species, *Trichoderma atroviride* is clearly shown to be less sensitive than the two pathogens. In greenhouse, even when mustard is attacked by *R. solani* (spring conditions), a significant decrease in soil inoculum potential is observed all through the succession, whatever the line of mustard. No significant effect of *T. atroviride* is demonstrated. A strong and highly significant reduction of incidence and severity of the disease on mature carrots is observed at the end of the experiment.