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Potential of Brassica cover crop and biofumigation to reduce *Verticillium dahliae* germination and Sunflower Verticillium Wilt

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Abstract

Sunflower Verticillium Wilt (SVW), caused by *Verticillium dahliae*, has been a widespread soilborne disease in France since 2011, causing up to 50% yield loss. Since the prohibition of chemical fumigants, SVW management has been challenging. The fungus can persist in the soil as microsclerotia for nearly 13 years and survive without suitable host. In this context, Brassicaceae or crucifer cover crops are interesting for pathogen suppression due to the release of biocidal hydrolysis products such as isothiocyanates (ITCs) from glucosinolates (GSLs) present in their tissues. Crucifer can generate GSL-related biocidal effects both during the growing period around roots (allelopathy) or when tissue disruption occurs following cover crop incorporation (biofumigation).

Because GSL types and concentrations vary among crucifer species, and between root and shoot tissues of the same species, this study first aimed at characterizing the GSL profile of 21 crucifers. Thus, to evaluate the potential of grinded crucifer on the fungus and biofumigation on SVW, (i) the toxicity of 5 selected crucifers was assessed on *V. dahliae* microsclerotia germination and development in a laboratory assay and (ii) two field trials aimed at evaluating the biofumigant potential of the 3 most efficient crucifers, grown during the fallow period, by assessing weakly disease symptoms on sunflowers .

Brown and white mustard, fodder radish, turnip rape and rapeseed were selected for their higher concentration and diversity on GSLs. All crucifers reduced *V. dahliae* microsclerotia germination on growing media by 90% (brown mustard) to 63% (fodder radish), and fungus development by 90% (turnip rape) to 69% (white mustard) compared to control treatments without tissues. In the field, biofumigation after brown mustard, fodder radish or turnip rape reduced significantly the incidence and severity of SVW compared with bare soil both years. These results indicate that crucifer cover crops could have a potential to reduce SVW.

Key words: *Verticillium dahliae*, sunflower, glucosinolates, biofumigation, Brassicaceae, cover crops.