



Assessment of the biofumigation potential of *Brassica* species against Sunflower Verticillium Wilt (*Verticillium dahliae*) – A field-experiment approach

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Abstract

The soilborne fungus *Verticillium dahlia* is responsible for sunflower verticillium wilt (SVW), which can cause up to 50% yield loss. In a context of chemical inputs' reduction, biofumigation can be an alternative and ecological pest management practice to reduce soilborne inoculum. *Brassica* crops used as green manures and biofumigation activity has been linked to volatile Isothiocyanates (ITCs) released from glucosinolates (GSLs) during tissues disruption. Their toxicity against *Verticillium dahliae* has been shown in laboratory experiments but never against SVW in the field.

Because GSL types and concentrations vary among crucifer species, and between root and shoot tissues of the same species, this field study aims to assess the biofumigation potential of 3 *Brassica* cover crops to reduce SVW damages and sunflower yield loss in Toulouse (France) in 2016 and 2017. Brown mustard (BM), turnip rape (TR) and fodder radish (FR) were disrupted and the potential of biofumigation against SVW was compared to bare soil (BS). Cover crops biomass and GSLs content were measured at destruction. On sunflowers, disease symptoms (incidence and severity) were observed weekly on tagged plants. The disease severity index (DSI) and the areas under disease progress curves (AUDPC) have been calculated and the yield was measured for all treatments.

For both experiments, first symptoms of SVW were observed after BS. The incidence and the severity of SVW were the highest compared with sunflowers after biofumigation. At sunflower maturity, the DSI levels was the highest after BS with 80 % and 48 % in 2016 and 2017 respectively. The DSI level was significantly lower BM (46 % and 44%), TR (39% and 38 %) and FR (37% and 28%) for both years. AUDPC values were negatively correlated to aliphatic GSLs quantities. Moreover, sunflower yield after *Brassica*'s cover crop was higher from 0.2 to 0.8 t/ha compared with bare soil. These results showed that biofumigation could contribute to manage SVW and enhance sunflower's yield.

Keywords: *Verticillium dahlia*, *Brassica*, cover crop, biofumigation, glucosinolates, agroecological crop protection, sunflower productivity.