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Phenolic acids play a vital role in compatibility of *Fusarium oxysporum* f.sp. *strigae* biocontrol ability with legume intercropping for striga management in maize

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Abstract

Striga is the major threat to cereal production in sub-Saharan Africa. In this work, we examined the compatibility of legume intercropping with the biological control approach for efficient *Striga* management. The effect of phenolic acids (PA) and crude root exudates from three legume crops on *Fusarium oxysporum* f.sp. *strigae* (Fos) FK3 were investigated. The result showed that some PA inhibited Fos mycelial growth and spore germination. Piperonylic acid and Cinnamic acid caused the strongest inhibition of Fos at 1mM and 0.5mM concentration. Others like p-coumaric, trans-ferulic, benzoic and 3,4-dimethoxybenzoic acid caused a slight inhibition at higher concentrations. All the other tested PA at all concentrations didn't cause inhibition. The crude root exudate collected from Crotalaria caused strong Fos mycelial inhibition at 1 mg ml^{-1} and 0.5 mg ml^{-1} while the exudate from *Desmodium* and *Mucuna* didn't cause inhibition on Fos mycelial growth. The result from pot experiment showed that emerged *Striga* count per pot was significantly lower in all treatments compared to the control (*Striga* only). However, the lowest *Striga* count was noticed on pots with *Desmodium* + Fos, which was not significant with the negative control (no *Striga*), unveiling the strongest *Striga* suppression. Significantly lower maize dry biomass was noticed on pots with *Mucuna* + *Striga* and control (*Striga* only). QPCR-based Fos abundance measurement revealed that Fos gene copy number was more abundant on pots with the presence of legumes, indicating its proliferation is not affected by legumes. LC-MS/MS analysis of PA from rhizosphere soil depicted that PA concentration is influenced by the cropping system. P-coumaric acid was detected in higher concentrations in all treatments. Relatively, a slight increase in some of the PA were detected in maize + *Striga* than the negative control (maize alone), suggesting *Striga* infestation triggered PA exudation from maize. Interestingly, Piperonylic acid was detected only in treatments that have *Mucuna* plant. Generally, legume intercropping with maize didn't inhibit the proliferation of Fos in the rhizosphere soil, indicating their integration could be compatible *Striga* management options.

Keywords: Fos proliferation, integrated *Striga* management, piperonylic acid

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