Effects of Soil Fertility Management and *Trichoderma asperellum* on Severity of Wilt Disease of Passion Fruits

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ABSTRACT

Passionfruit is the third most important export fruit crop in Kenya after mango and avocado. Plant diseases are the main constraint to passionfruit production resulting in 40 to 100% yield losses. Passionfruit wilt disease caused by *Fusarium oxysporum* f. sp *passiflorae* is of economic importance in Kenya. Management of this disease is difficult because the pathogen persists in the soil for many years. Chemical controls are expensive and in most cases not effective. The most economical control method is the use of tolerant rootstocks, such as the yellow passionfruit, which however succumbs to the disease in some cases. This study was conducted to investigate effects of soil fertility management and application of *Trichoderma asperellum* on control of passionfruit wilt disease. In the first experiment, soils managed under organic, integrated and virgin systems were collected from farmers' fields and used to set up a bioassay in a greenhouse using the purple passionfruit seedlings. The soils were inoculated with a field isolate of *Fusarium oxysporum* f.sp. *passiflorae* (FoP) at 2.25 x 10^4 colony-forming units (CFU)/g. Split plot design with three replicates was used. Microbial populations of the antagonists *Trichoderma* spp, fluorescent pseudomonads and actinomycetes were determined by serial dilution two months after transplanting and repeated once per month for eight months. Second experiment was done four weeks after the first experiment. In this experiment, the soils were inoculated with *T. asperellum* at 5 x 10^7 CFU/ml and three weeks later with FoP at 2.25 x 10^4 CFU/g. Split-split plot design with three replicates was used. Disease severity, in both experiments, was assessed by length of vascular discolouration and chlorosis at the end of experiment. Data was analysed using Analysis of Variance (ANOVA) and treatment means were separated using Student–Newman-Keuls test. In the first experiment, disease severity was not

significantly different (P≤0.05) between organic and integrated managed soils but significantly lower (P≤0.05) in virgin soils. Organic soils had significantly higher (P≤0.055) population of antagonists than virgin and integrated soils. Organic soils were not more effective in controlling the disease than integrated soils probably because they did not have sufficient amount of organic matter that could sustain prolonged microbial activity. Virgin soils were more effective than organic and integrated soils in controlling the disease probably because of higher microbial diversity that has been reported in virgin soils compared to arable soils. This has been reported to enhance antagonism against soilborne pathogens. In second experiment, disease severity was significantly lower in *Trichoderma* treated soils than non-*Trichoderma* treated soils with organic soils having the lowest severity. Reduced disease severity in *Trichoderma* treated soils was as a result of microbial antagonism by *T. asperellum* against *F. oxysporum* f.sp. *passiflorae.* Organic matter improved efficacy of *T. asperellum*. The results propose an integrated and sustainable approach towards management of wilt disease of passionfruits by using biocontrol agent *T. asperellum* and addition of organic matter.

Keywords: Chlorosis, vascular discolouration, organic, integrated, virgin.