

Biocontrol of *Fusarium* species utilising indigenous rooibos and honeybush extracts

Beauty E. Omoruyi

Cape Peninsula University of Technology, South Africa

Mycotoxins produced by several *Fusarium* species does not only have a significant effect in the reduction of maize yield and grain quality but have led to food safety concerns. The antifungal activity of rooibos (*Aspalathus linearis*) and honeybush (*Cyclopia* spp.) tea extracts reduced the growth of plant pathogen *Botrytis cinerea*, but their efficacy against *Fusarium* spp. is unknown. In this study, we examined the effect of fermented and unfermented rooibos and *Cyclopia subternata* aqueous extracts as well as green tea (*Camellia sinensis*) against 10 *Fusarium* species. Viability of conidia was determined by measuring ATP using the BacTiter- Glo™ assay and Scanning Electron Microscopy. IC₅₀ was calculated with GraphPad Prism 5.01 software. Fermented rooibos extract (20 mg/mL) decreased the spore viability of *F. verticillioides* MRC 826-E, *F. subglutinans* MRC-8553, *F. proliferatum* MRC-8549 and *F. globosum* MRC-6647 to 9.53% (IC₅₀ 1.19±0.05), 9.26% (IC₅₀ 1.79±0.05), 11.0% (IC₅₀ 0.77±0.04) and 12.7% (IC₅₀ 1.47±0.03), respectively, while unfermented rooibos decreased their spore viability to 44.4% (IC₅₀ 4.97±0.31), 29.5% (IC₅₀ 12.56±0.37), 23.6% (IC₅₀ 8.26±0.41) and 22.9% (IC₅₀ 4.01±0.17). The fermented *C. subternata* (20 mg/mL) extract exhibited a significant effect on spore viability of *F. subglutinans* MRC-8553, *F. subglutinans* MRC-8554, *F. proliferatum* MRC-8550 and *F. verticillioides* MRC 826-E with a reduction to 3.79% (IC₅₀ 6.63±0.06), 6.04% (IC₅₀ 9.47±0.13), 6.04% (IC₅₀ 1.75±0.21), 8.40% (IC₅₀ 4.28±0.31), respectively. While the unfermented *C. subternata* had a less inhibitory effect on the conidia of these strains at 44.9% (IC₅₀ 10.83±0.47), 34.6% (IC₅₀ 13.87±0.39), 87.1% (IC₅₀ 45.88±11.36) and 76.7% (IC₅₀ 32.95±0.61). Scanning electron microscopy of *Fusarium* conidia exposed to teas showed irreversible deleterious morphological and ultrastructural alterations, such as lack of cytoplasmic contents, loss of integrity, and rigidity of the cell wall, plasma membrane disruption, and collapsed conidia cells. Overall, the fermented rooibos and honeybush extracts showed a higher antifungal activity against the *Fusarium* species than the unfermented extracts.

Keywords: Rooibos, honeybush, *Fusarium* species, conidia viability, ultrastructure.