Project Title:
Using biological control (fungi and nematodes) against two sporadic pests in vineyards and orchards.

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Objectives and Rationale

Katydids (Plangia graminea) and weevils (Phlyctinus callosus), BFW, are sporadic pests of vineyard in the Western Cape province of South Africa. They primarily feed on foliage, which during pest outbreaks, may result in reduced vigour and stunted development. An increase in their density and distribution have been reported, and no agrochemicals are currently registered for their control. Previous research identified possible biological control agents, including entomopathogenic fungi (EPF) and parasitic wasps. The aim of this study was to (i) evaluate the efficacy of EPNs and EPF against katydids and weevils; (ii) to determine an estimate of katydid geographical distribution and to (iii) record observations made in field and laboratory populations.

Methods

Field collected insects were screened against 12 in vivo-cultured EPN species at 200IJ / insect, in a laboratory environment, incubated at 25°C and >95% RH for 48 h, after which mortality was assessed. Geographical distribution was estimated by plotting reported and verified katydid occurrence sites. In total, 70 soil samples were collected from deciduous fruit orchards and vineyards in the Western Cape. The soil samples were baited with mealworms, Tenebrio molitor (Coleoptera: Tenebrionidae) to trap EPNs and EPF. A field trial to determine the performance of Steinernema yirgalemense, applied at different concentrations, followed. The EPF were either applied alone, in simultaneous combination with S. yirgalemense, or 1 and 2 weeks after fungal application; the EPNs were also applied alone.

Key Results

Seven locally isolated EPN species achieved significant mortality, of which H. zealandica, H. indica, S. jeffreyense and S. yirgalemense performed the best (> 90% mortality). Katydids were reported from 36 locations, primarily in the Cape Winelands region of the Western Cape, of which 12 were confirmed by site visitation. EPNs were isolated from 17 % (12) of the samples, with Heterorhabditis bacteriophora and H. safricana as the only two EPN species isolated. Steinernema yirgalemense, H. noenieputensis, and Steinernema feltiae resulted in significantly higher ($p < 0.05$) control of BFW larvae at a concentration of 100 IJs/insect, compared to the other EPNs, with no significant difference between each other. In the field trials, S. yirgalemense, at 20 and 40 IJs/cm2, gave 69 % and 78 % mortality for BFW larvae, respectively. The results showed that all EPNs screened controlled the different life stages of the BFW. Results showed that 100% larval and adult mortality was obtained when S. yirgalemense was applied 1 or 2 weeks after Eco-Bb and BroadBand®

Key Conclusion of Discussion

Katydid nymphs have proven susceptible to EPN infection. The efficacy of in vitro-cultured EPNs in field trials, in combination with adjuvants and as part of an IPM program, would further provide clarification on the value of EPNs as biological control agents.
Both entomopathogens have shown outstanding potential to control the BFW when used alone, and in combination, could provide an economically viable control strategy against the BFW.

Recommendation to Industry / Key take-home message

Laboratory trials have shown the viability of using alternative control methods to chemicals. The next step would be to field test these products on a larger scale to assess the practicality and efficacy.