Biopesticides for New Zealand's pests – opportunities and challenges

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Biopesticides can provide effective control of existing and invasive invertebrate pests and diseases impacting on New Zealand's primary sector production, and combat new pests emerging as a result of land-use change, farming intensification and climate change. While the international biopesticide market is undergoing rapid growth at present, assisted by regulatory environments favourable to biopesticide registration and uptake, biopesticides are not widely used in New Zealand. The number of biopesticides registered under the Agriculture Compounds and Veterinary Medicines Act (Ministry for Primary Industries, MPI) has slowly increased from 11 products in 1991, to 33 in 2010, with 49 registered in 2015. However, only a limited number of these products are actively marketed and used by growers at present. To play an increasing role in New Zealand's sustainable production systems, next generation biopesticides will need to have levels of efficacy comparable to currently available controls, and will be able to be used by farmers with minimal change of practice. This will be achieved through use of a new suite of microorganisms with broader host ranges and different modes of action from currently available microbial agents, together with new cost effective production and delivery systems. Efficient commercialisation of New Zealand-appropriate biopesticides will also be facilitated by proposed changes to the registration process including the development of MPI's new Biological Pesticides Standard.

Comparison of application of root endophytic *Trichoderma* into established kiwifruit orchards

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The kiwifruit disease *Pseudomonas syringae* pv. *actinidiae* (Psa) was first identified in New Zealand in 2010 and currently affects over 85% of the country's kiwifruit orchard area. This research focused on root endophytic *Trichoderma* as a biological control option for Psa, as these fungi can limit the damaging effects of pathogens through antibiotic metabolites, induce systemic resistance and improve plant health. Promising biocontrol isolates were identified by inoculating kiwifruit with *Trichoderma* under controlled conditions and in the field before exposing them to Psa. The mixture TriMix-1 emerged as one of the best performing treatments consistently lowering disease incidence and increasing kiwifruit seedling longevity. To assess persistence in kiwifruit roots and determine the best method to apply TriMix-1 into existing orchards, endophytic fungi were re-isolated from kiwifruit roots at two organic NZ kiwifruit orchards following four treatments: *Trichoderma* root application with (N) and without nutrient solution (T); surface application with vermicompost (V); untreated control (C). While similar numbers of *Trichoderma* were isolated from the two sites, treatment effects were significant and treatments T, V and N increased *Trichoderma* counts compared to the untreated control. Inoculation of older orchard vines using a suitable application method facilitates the establishment of a strong root endophytic *Trichoderma* community that can improve plant health.