Grass grub work at FAR

2012 – SFF: Managing the number one soil borne pest in cropping 3 years

Between 2012-14 FAR/AgResearch completed six field trials as part of an MPI SFF project (project number 12-013). The key findings of this research was summarized by Mansfield et al. (2017), Chynoweth et al. (2013) and Mansfield et al. (2015).

Abstract from by Mansfield et al. (2017).

Insecticidal seed treatments are used commonly worldwide to protect seedlings against root feeding insects. Organophosphate insecticides that have been used for seed treatments are being phased out and replaced with neonicotinoid insecticides. Concerns about the environmental impact of neonicotinoids have prompted a search for alternatives. Microbial insecticides are a biological alternative for seed treatments to target root feeding insects. Six field trials with organophosphate granules (diazinon, chlorpyrifos), neonicotinoid seed treatment (clothianidin) and microbial (Serratia entomophila) seed treatment targeting grass grub, a New Zealand scarab pest, were conducted in wheat crops at several sites over 4 years (2012–2015). Sites were selected each year that had potentially damaging populations of grass grub present during the trials. Untreated seeds led to significant losses of plants and wheat yield due to lower seedling establishment and ongoing plant losses from grass grub damage. Insecticide and microbial treatments increased plant survival in all trials compared with untreated seeds. Better plant survival was associated with higher yields from the insecticide treatments in four out of six trials. Neonicotinoid seed treatment alone gave similar yield increases to combined neonicotinoid seed treatment and organophosphate granules. Microbial seed treatment with S. entomophila gave similar yield increases to insecticide treatments in two out of six trials. Seed treatment with S. entomophila is an alternative for grass grub control; however, development of a commercial product requires effective scale-up of production, further research to improve efficacy, and viability of the live bacteria needs to be maintained on coated seed.

During this project FAR found a new predator (*Ostenia robusta*) of grass grub pupa which had not been recorded before. *Ostenia robusta* is a native fly of which only the adult had been found and described prior to this study. We have now identified that the larvae are soil dwelling and predatory toward grass grub and potentially other soil inhabitants. We have undertaken two seasons of research but are still unsure if *Ostenia robusta* will provide useful control in the future, this requires further research.

Total expenditure: $306,868. Total FAR expenditure $126,697.

During project 12-013, the insecticide SuSCoN Green (active ingredient (a.i.) 100 g/kg chlorpyrifos) registration was extended to include cereals as the removal of Phorate and Diazinon left no control options outside neonicotinoid seed treatments. However, the chlorpyrifos active has now been banned in the European Union and future supply to NZ may be limited going forward. https://ec.europa.eu/food/plant/pesticides/approval_active_substances/chlorpyrifos_chlorpyrifos-methyl_en

The use of liquid Diazinon for follow up treatment of cereal crops post sowing also achieved registration at a similar time. If SuSCon Green disappears from the market due to removal of use in Europe, Diazinon will become more important in the cereal and seed crop space.

2018 SFF 3 years – This is additional to and separate from A Lighter Touch

This project will test new solutions for grass grub control in arable crops and facilitate innovation by supporting arable farmers to adopt new pest management tools.

New solutions

Microbial treatments offer an alternative to chemical insecticides for seedling protection and have shown efficacy against grass grub in arable crops (Mansfield et al. 2017). Adoption of such new technology requires demonstration of consistent performance under real world conditions on farm and the technology needs to fit readily into existing crop management practices.
The current biological product available for grass grub control is a bacteria (*Serratia entomophila*, sold as Bioshield) that is best applied as a preventative treatment. It is effective but comparatively slow acting and takes 2-3 years to build up on farm before achieving maximum control of grass grub. This timeline may be acceptable in perennial pastures but is not a good fit for the shorter crop cycles of arable farmers, who need a rapid acting biological alternative that is similar in efficacy to chemical insecticides. The novel bacterium *Serratia proteamaculans* AGR96X is highly effective against grass grub, causing death within 5-12 days after feeding (Hurst et al. 2018). This is fast enough to give similar results to existing chemicals like diazinon, provided the bacterium can be delivered effectively on farm.

Total expenditure: $306,868. Total FAR expenditure $58,000 with additional $15,800 inkind, Seed Industry Research Centre $30,000.

2020 – FAR internal trials – other biologicals

FAR has investigated the potential role of four alternative control options in a laboratory experiment run during the winter of 2020. This will progress to a field experiment in the autumn of 2021, estimated spend is $15,000.

References

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