FINAL REPORT

GRDC
GRAINS RESEARCH & DEVELOPMENT CORPORATION

DAQ00153

Northern Pulse and grains IPM

PROJECT DETAILS

PROJECT CODE:	DAQ00153
PROJECT TITLE:	NORTHERN PULSE AND GRAINS IPM
START DATE:	01.07.2009
END DATE:	30.06.2014
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Summary

Insect pest management is a challenge to many growers and advisers because the suite of pests they deal with changes constantly. The outputs from this project have contributed significantly to providing increased knowledge and capacity among advisers and growers to manage their insect pests profitably and sustainably. Research and development (R&D) on pest biology, ecology, economic thresholds, sampling methods and effective control options have contributed to building a robust integrated management strategy for insect pests. The management endeavours of industry have been supported through the provision of diagnostics, responsive R&D, training, and broad-based communication.

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Old or Archival Reports (Projects that concluded in 2007 or earlier)

The information contained in these older reports is now several years old, and may have been wholly or partially superseded or built upon in subsequent work funded by GRDC or others. Readers should be aware that more recent research may be more useful for their needs. Findings related to agricultural chemical use are also potentially out of date and are not to be taken as a recommendation for their use.

Conclusions

Pest management packages for industry:

Considerable progress has been made to provide industry with comprehensive guidance on pest identification, monitoring strategies, economic thresholds and control options. The sporadic nature of many pest outbreaks means that it takes some years to develop and then validate management tactics. Some of the packages are not final, but they contribute far more than was available to industry five years ago.

Recommendations

GRDC may have a role to play in facilitating a 'path to market' for insecticide options that are not currently of priority to agrochemical companies. For example, softer options for helicoverpa control in sunflower, sucking pests in sunflower and summer pulses demand urgent attention. With the registration of Altacor®# in summer and winter pulses, and existing registrations in cotton, there is now year-long use of this product. It is increasingly important, from a stewardship point of view that the grains industry looks at developing a resistance management strategy for key insecticides. It is essential that, in conjunction with any Insecticide Resistance Management Strategy (IRMS), there is a resistance monitoring effort to reinforce in an industry that its efforts are being rewarded (or otherwise).

Formal evaluation of the level of Integrated Pest Management (IPM) adoption, or simply pest management practice, is long overdue in the northern grains region. Dedicated investment in this area is warranted to provide strategic guidance in terms of priority research, development and evaluation (R,D&E).

Outcomes

Economic benefits

No economic evaluation has been done on the contribution of improved insect pest management resulting from this project. However, the reduction of just one insecticide application that is likely, if recommendations for mirid, armyworm, and aphid management are adopted, would be in the vicinity of $15/ha of mungbeans, barley or canola grown.

Economic benefits have accrued in the industry through the provision of management strategies where there were previously none. The impact of this outcome is to reduce the likelihood of poorly timed or unnecessary insecticide

application. The value is difficult to quantify, but just one example of the benefit that can accrue is the finding that armyworms do not always lop heads, which resulted in over 40,000ha of wheat and barley not being sprayed prophylactically by the two agronomists with whom the project researchers collaborated. The economic benefit to their growers was a saving of $15/ha in insecticide application. Multiply this figure out across the northern region's wheat and barley crops in most years and it is significant.

Environmental benefits

The environmental benefits contributed to by this project potentially apply to all crops, but are hard to quantify. Better informed and skilled growers and agronomists are likely to be more strategic with their insecticide use, minimising the number of prophylactic, poorly targeted or mistimed applications. The environmental benefits of this outcome accrue to the environment, and the community.

This research has contributed to increasing the targeted and strategic use of insecticides, reducing the residues in the environment and potentially in harvested grain. Benefits also accrue through reducing the risk of insecticide resistance development in key species and the preservation of species that provide ecosystem services (biological control, pollination, decomposition). Improving these latter outcomes contribute further to the sustainability of pest management in grains.

Social Benefits

Considerable social benefits have been derived from the extension and training activities delivered by this project. The information and training has improved grower and advisor knowledge, capacity and confidence in key areas related to decision making. These outcomes contribute to the maintenance of skilled staff in agri-businesses and on farms in the region.

Extension activities over the life of the project have built the capacity of advisers, growers and other industry personnel to better understand the drivers, the ecology and management, of insect pests of summer and winter field crops in the northern region. Project staff have given over 100 presentations at grower meetings, field days, GRDC updates, conferences and training workshops. The pest management modules developed for sunflower, mungbean, soybean and chickpea have been delivered at over 50 workshops. Staff have supported learning and decision-making through their involvement in on-farm research, industry networks and availability, to discuss issues and options directly with growers and agronomists.

Achievements/Benefits

Objective

To increase the adoption of IPM practices in broadacre grain production systems in the northern grains region. An increased understanding of pests, monitoring techniques and economic thresholds, and the deployment of biological, chemical and cultural management options, will underpin change in practice. These changes will be facilitated by research, development of management packages, education and extension.

Background

The broadacre grains industry is currently highly dependent on the use of insecticides to manage major insect pests. For the most part, these insecticides are broad spectrum in their activity, killing both the pest and natural enemies that may otherwise suppress pest populations. Whilst softer options are becoming available for key grain pests, many remain problematic with no soft options yet available. IPM addresses both short term control (largely chemical or biological insecticides) and the implementation of non-chemical tactics that exploit susceptibilities in the pest biology or ecology to reduce their impact on the crop. These tactics include the management of alternative hosts (weeds), host plant resistance, tillage and stubble management, and the preservation of natural enemies (beneficials) through the judicious use of insecticides and less disruptive insecticide products. In addition, decisions about if and when control is required must be assessed through efficient and effective crop monitoring and the application of knowledge about likely crop loss (economic thresholds). Research, development and communication activities address these challenges.

Research

Research addresses a suite of pests of winter cereals, winter pulses, summer pulses and coarse summer grains. Field and laboratory trials examine the relationship between crop and pest to establish crop loss models that underpin economic thresholds. In conjunction, effective sampling methods are developed to enable growers and advisers to assess pest

populations in relation to established economic thresholds. Key pests for which these outputs have been delivered are helicoverpa in summer pulses and chickpeas, RGB in sorghum, and podsucking bugs in soybeans and mungbeans. The biology and ecology of these pests and their natural enemies are important in understanding the likely drivers of pest outbreaks and the optimal timing for the application of control and implementation of management tactics. Evaluation of the efficacy and disruptiveness of new insecticides provides information about their impact on beneficials and their place in an IPM strategy. More recently, the potential impact of natural enemies on pest populations has been an area of research aiming to determine how agronomists can factor natural enemy abundance into their decision making.

Supporting growers and agronomists as they become aware of options and consider implementing them is vital to achieving practice change. Consequently, the development of practical management advice and the education of growers and advisers in their application is a natural extension of the research effort. Web-based repositories of information and the delivery of timely seasonal information contribute to this outcome. Extension aims to raise awareness of alternative practices, increase knowledge and understanding of pests and their interaction with the crop, and provide ongoing support in the form of information, tools and expertise. This is achieved through workshops, field days, contact with entomologists, traditional media and, more recently, social media.

Insecticides

Insecticides remain a cornerstone of pest management, and much of the research effort in this project has been focused on evaluating the efficacy of less disruptive options compatible with IPM – including new options for crops where registrations are limited or non-existent – and investigating alternatives in the face of product withdrawal by the Australian Pesticides and Veterinary Medicines Authority (APVMA) (e.g. dimethoate#, widely used for the control of sucking pests – mirids, aphids, RGB). Outcomes of this research have included the provision of data to support the registration or permitted use of IPM compatible options in summer pulses (e.g. Altacor®# for etiella and beanpodborer; pirimicarb# for aphids in pulses). Evaluation of new products, particularly in relation to their relative efficacy and disruptiveness, enables the provision of independent advice to industry on the use of these products.

The use of insecticides must be guided by an understanding of if and when a pest infestation will cause significant crop loss. The development of an understanding of the relationship between insect pests, the crop, and the potential for loss and/or compensation has been a major area of research attention. This understanding underpins the development of economic (action) thresholds. The research undertaken during this project has improved understanding of the potential impact of helicoverpa in mungbean and soybean, podborers in mungbeans, etiella in vegetative soybeans and mungbeans, armyworm in barley, aphids in winter cereals, aphids in canola, loopers in sunflowers, stemfly in soybeans, helicoverpa in faba beans and solenopsis mealy bug.

To facilitate the use of economic thresholds by growers and their advisers, online calculators have been devised that enable the entry of field data, and provide a recommendation on whether treatment is warranted. These calculators are now available for podsucking bugs in summer pulses, helicoverpa in sorghum and chickpeas, and sorghum midge.

The sporadic nature of many species and the infrequent nature of severe outbreaks are features of insect pests in the northern grains region. The confidence of growers and agronomists in identifying and determining a course of action for insect pests is severely tested by the constantly changing spectrum of pests. Considerable effort has been put into providing industry with ready access to practical information on pest activity and management considerations through a broad range of extension activities. A key platform for communication with industry is the Beatsheet blog (www.thebeatsheet.com.au), with currently over 300 subscribers of which an estimated 260 are in agribusiness (74% of the estimated 350 advisers in the northern region). This reach makes the Beatsheet a powerful vehicle for communicating vital information when it is relevant. Participation in industry field days, updates, conferences, media releases, Ground Cover articles and a host of other communications, ensure that important messages are heard widely in the region.

Project staff have developed and delivered insect pest management modules for mungbean, soybean, sunflower and chickpea to over 600 participants during the life of this project, in conjunction with Pulse Australia, the Agricultural Management Assistance Program (AMA), Better Sunflowers and SoyAustralia. Testament to the importance of these workshops is the level of the 'repeat' business, with advisers recognising the importance of keeping up to date with research outcomes, changing recommendations, and attending the courses more than once.

The northern region grains industry does not operate in isolation, and the project team has established excellent networks with other industries (cotton, through participation in the Transgenic and Insect Management Strategies (TIMS) committee),

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with researchers in other organisations (through regular contact, and hosting the IPM Forum) and nationally through participation in the NIPI, the Grains Pest Advisory Committee (GPAC) and its National Insecticide Resistance Management (NIRM) working group.

Overview of Project Achievements

Integrated Pest Management (IPM)

IPM remains high on the agenda of grain producers in the GRDC northern grains region. Over the past decade, considerable progress has been made in the development, implementation and adoption of IPM tactics for some major insect pests. These developments have resulted in reduced reliance on broad spectrum insecticides with flow-on economic, environmental and social benefits. They have also significantly increased the quality and crop value of many grain crops.

Several pest species are obstacles to the adoption of IPM because the options available to manage them are highly disruptive to beneficial insects and can flare secondary pests such as silverleaf whiteflies (SLW), aphids and mites. For many of these pests, action thresholds are well defined but very low, or are poorly defined. As a result, decision-making tends to err on the conservative side, resulting in over-use of disruptive insecticides. It is also recognised that cost effective options for some difficult to manage pests are not available to grain growers. To be successful, IPM in the northern region needs to be multi pest/multi crop, and where possible, applied on an area-wide basis to incorporate all components of the farming system.

Intellectual property summary

No commercialised outputs.

Additional information

Brier, H (2012). The Good Bug, Bad Bug Book.
Factsheets
Soybean stemfly – GRDC 2014
Rutherglen bug in Sunflower – GRDC 2014
Sorghum Midge spray calculator – GRDC 2013
Integrated Pest Management Fact sheet – northern region – GRDC June 2012

Brier, H. (2013), New insecticide options for mungbeans, soybeans and other summer pulses: what's coming, how effective they are, and what's their IPM potential? Proceedings of the 2013 Australian Summer Grains Conference.

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Charleston K, Miles M and Brier H.(2011) IPM workshops for growers and consultants – lessons for R, D and E. APEN National Forum, Armidale, November 2011. Published in Extension Farming Systems Journal volume 7 number 2 – Industry forum.

Brier H., Quade A., and Wessels J. (2010). Economic Thresholds for Helicoverpa and other pests in summer pulses – challenging our perceptions of pest damage. Proceedings of the 2010 Australian Summer Grains Conference.

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Bellati J, Henry K, Umina P, Charleston K, Mangano P, Brier H, Severtson D and McLennan A. (2009). From boring bug lectures to interactive invertebrate learning – Using audience participation software to 'actively' transform grains industry training. APEN Conference, Busselton WA (2009). Published in Extension Farming Systems Journal volume 5 number 2.

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Rogers, D. J. and Brier, H (2009). "Pest-damage relationships for Helicoverpa armigera (Hubner) (Lepidoptera: Noctuidae) on soybean (Glycine max) and dry bean (Phaseolus vulgaris) during pod-fill." Crop Protection 29(1): 47-57

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