What is invertebrate pests in agriculture

Choose a button or view a list of ALL INVERTEBRATE PESTS. Detailed information about certain pests can be found in the Pest Notes Library. If you don't know what your pest is, search by plant type: Home | Pests and Pesticides in Agriculture The purpose of this study was to estimate the value of current and potential losses from invertebrate pests for the six most important Australian grain crops. Invertebrate pest species were identified using Australian literature and advice from entomologists with experience in grain crops. Current and potential losses from invertebrates were estimated through a survey of entomologists and reported on a GRDC Region basis. Estimates were prepared for wheat, barley, oats, canola, lupins and grain sorghum. Based on current loss the three most important invertebrate pests of wheat are redlegged earth mite, blue oat mite and locusts. These three species are also the most important invertebrate pests of barley and oats. The three most important invertebrate pest species of canola are diamondback moth, redlegged earth mite and canola aphids (various species) while for lupins they are aphids (various species), budworms and bryobia / balaustium (various species) mite. The most important invertebrate pests of grain sorghum are budworm (corn earworm), sorghum midge and false wireworms (various species). Aggregated across the six major Australian grain crops, the estimated present annual loss due to invertebrate pests totalled $359.8 million. The relative importance of invertebrate pests varied between regions. Nationally, the five most important invertebrate pests, based on estimated present losses aggregated across the six crops, were redlegged earth mite ($44.7 million), budworms ($36.3 million), blue oat mite ($35.5 million), lucerne flea ($28.4 million) and locusts ($28.4 million). Present cultural and pesticide controls of invertebrate pests effectively reduced losses by $1,366.1 million, but pest management remained very dependent on pesticides. Nationally, pesticide treatment costs aggregated across all six crops totalled $159.1 million. Results from this study will inform future GRDC investment decisions related to invertebrate pests. Author: Dave A. H. Murray, Michael B. Clarke and David A. Ronning Organisation: Grains Research and Development Corporation Published: February 2013 Published by: Grains Research and Development Corporation Invertebrate pest management in grains is complex and adoption of integrated pest management approaches is slow, so innovative new approaches are being examinedSelection pressure is a main driver of resistance evolution. Work is underway to better estimate such pressures for grains pestsThe potential for manipulating endosymbionts (bacteria that live in insects) is being explored to see if they can be used to disrupt insect pest survivalEmerging issues such as insecticide resistance in key pests, possible regulatory withdrawal of important chemicals in the future and a growing recognition of the role that beneficial insect species can play are motivating growers and researchers to seek novel solutions to the challenge of insect pest control.The Australian Grains Pest Innovation Program (AGPIP) – a collaboration between the Pest & Environmental Adaptation Research Group at the University of Melbourne and cesar, with GRDC and University of Melbourne investment – is looking to apply out-of-the-box thinking to some of the grain industry's most troublesome pest management challenges.In Australian grains, insect pests are responsible for more than $350 million in yield loss or damaged product per year. Insect damage to crops can occur directly through feeding damage or indirectly through the transmission of viruses. The cost of controlling pests involves labour, product purchase and application, monitoring and testing costs, and professional advice. It can represent a significant expense in a farm's yearly budget and issues such as insecticide resistance can further complicate pest management.Led by Associate Professor Paul Umina and Professor Ary Hoffmann at the University of Melbourne, AGPIP is undertaking research and extension activities that support the transition to more sustainable and cost-effective pest management practices."We seek to shine a light on some of the remaining mysteries when it comes to control of insect pests," says Associate Professor Umina."This will support better-informed decisions about control of certain key pests as well as potentially offering new options for pest management. Sometimes you need to think laterally to achieve a step change in how we approach these issues."The understanding of the importance of beneficial insects in integrated pest management needs to be bolstered. Ladybird beetles can play a significant role, here feeding on an aphid colony. Photo: Dr Andrew Weeks, cesarDrivers of resistanceInsecticide resistance is a growing issue for the grains industry, with common pests such as the green peach aphid (Myzus persicae), redlegged earth mite (Halotydeus destructor), diamondback moth (Plutella xylostella) and cotton bollworm (Helicoverpa armigera) having already evolved resistance to registered insecticide options.The evolution of resistance in pest populations reduces the options available for managing potential outbreaks and can increase selection pressures for remaining chemical actives.While selection pressures (such as pesticide exposure) are a main driver of resistance evolution, the industry lacks reliable methods to estimate selection pressures for grains pests. Also, there is a variety of other factors that may accelerate or delay the evolution of resistance in an insect pest, including the local environment, species biology and ecology.By improving estimates of selection pressures and increasing the understanding of other factors driving resistance, AGPIP research will support identification of resistance risks before the resistance evolves or becomes widespread. This research will help the industry to predict when, where and how resistance might occur, and help direct the development of resistance management strategies.Enlisting beneficialsThe capacity for natural enemy species to contribute to pest management systems through their parasitism and predation is increasingly recognised. However, the incorporation of biological pest control practices into existing pest management strategies is constrained by knowledge gaps regarding the pest suppression capacity of natural enemy species in grain systems and the impact of pesticides on these species.AGPIP is looking to fill these gaps and develop a guide for growers that details insecticide and miticide toxicity ratings for natural enemies of grain pests. This work will combine existing research, with additional laboratory testing to fill knowledge gaps of pesticide impacts on species. The research will seek to account for both the direct impacts (through mortality) and sublethal impacts (such as on reproductive capacities) of the pesticides tested. In the long-term, the research will help grain growers identify chemicals that are less disruptive to their natural enemy populations so as to better utilise this free biological service.Associate Professor Paul Umina (right) answering questions with Greg Baker at GRDC Updates in South Australia. Photo: Rebecca JenningsEndosymbiont researchThe most blue-sky research being undertaken through AGPIP is examining options to manipulate tiny microorganisms living inside pest insects (called endosymbionts) to reduce the risk of crop damage and plant virus transmission.Endosymbionts are bacteria that live in the cells of other organisms (such as insects) in a symbiotic relationship. Co-evolving over thousands or millions of years, endosymbionts can become crucial to certain survival processes in the insect host. These processes may include nutrition, reproduction and resistance to external pressures such as insecticides. They may also impact on the insect's ability to transmit viruses and its susceptibility to predators.By manipulating endosymbionts within the insect, it is possible to disrupt these processes and weaken pests. AGPIP researchers are looking to use this approach in pest aphids to reduce the impacts of direct feeding damage and aphid-to-plant virus transmission. This will be achieved through transfers of particular endosymbionts from one aphid species into another, as well as the suppression of endosymbionts in pest species through heat and chemical treatments.Similar work is planned on endosymbionts in pest moth species and the beneficial species that attack the moths' larvae. This research aims to increase rates of parasitism and predation of the pests. Both the resistance of beneficial organisms to pesticides and their reproductive rates could be increased through endosymbionts, enhancing their efficiency in controlling pests. Led by Professor Hoffmann, the research team at the University of Melbourne has previously been successful in manipulating endosymbionts in mosquitoes to reduce transmission of Dengue virus."Taking the lessons learned from our work with mosquitoes, we hope to be able to replicate these successes in key insect pests and reduce the risk of crop damage for growers," Professor Hoffmann says.The manipulation of endosymbionts offers a different and more sustainable option for managing agricultural insect pests in the future, in which the microorganisms in the pest become as much the target as the pest itself.Watch the video AGPIP: Investigating novel technologies and management strategies to control insect pestsMore information: Francesca Noakes, 03 9349 4723, fnoakes@cesaraustralia.com

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Biol Control 68:92–102Article Google Scholar Page 2 From: Biological control using invertebrates and microorganisms: plenty of new opportunities Natural enemy Pest and crop Area under control (in ha) Trichogramma spp. Lepidopteran pests in vegetables, cereals, cotton 10 million, former USSRa Trichoderma spp. Soil diseases various crops 5 million, Brazil, Europeb Trichogramma spp. Lepidopteran pests in various crops, forests 4 million, Chinac Cotesia spp. Sugarcane borers 3.6 million, South America, Chinad Metarhizium anisoplae Lepidopteran pests in sugar cane 2 million, Brazile Trichogramma spp. Lepidopteran pests in corn, cotton, sugarcane, tobacco 1.5 million, Mexico Trichogramma spp. Lepidopteran pests in cereals, cotton, sugarcane, pastures 1.2 million, South America AgMNPV Soybean caterpillar in soybean 1 million, Brazil Beauvaria bassiana Coffee berry borer in coffee, whitefly in several crops 1 million, Brazilf Entomopathogenic fungi Coffee berry borer in coffee 0.55 million, Colombiag Trichogramma spp. Lepidopteran pests in cereals and rice 0.3 million, SouthEast Asia Trichogramma spp. Lepidopteran pests in sugar cane and tomato 0.3 million, NorthEast Africa Predatory mites Spider mites in greenhouses, fruit orchards, tea and cotton 0.07 million Chinah Trichogramma spp. Ostrinia nubilalis in corn 0.05 million, Europe Orgilus sp. Pine shooth moth, pine plantations 0.05 million, Chile >30 spp. of nat. enemies Many pests in greenhouses and interior plant-scapes 0.05 million, worldwide Egg parasitoids Soybean stinkbugs in soybean 0.03 million, South America Five spp. of nat. enemies Lepidoptera, Hemiptera, spider mites in orchards 0.03 million, Europe aRecent data about use of Trichogramma in Russia were not available bBettiol W and Pedrazzoli D, personal communication 2016 cLiu et al. (2014)and Wang et al. (2014) dParra JRP and Pedrazzoli D, personal communication 2016 eBettiol W and Pedrazzoli D, personal communication 2016 fBettiol W and Parra JRP, personal communication 2016 gAristizabal et al. (2016) hYang et al. (2014)