

A large, light orange circle is centered on the page. Inside this circle is a stylized outline of a house with a gabled roof and a chimney on the right side. To the upper left of the house, there is a smaller, solid orange circle. The background of the entire page is a solid, vibrant orange color.

# Final Report Summary

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Development of a Mycopesticide for control  
of lesser mealworm in meat chicken sheds



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## Background

Lesser mealworm (*Alphitobius diaperinus*), also known as darkling or litter beetle, is a significant insect-pest of the poultry industry in Australia and overseas due to its ability to carry avian and food borne pathogens and damage the structures of broiler houses through tunnelling. Current control measures for lesser mealworm are chemical-based and though somewhat effective, they produce residues and are subject to the inevitable development of insecticide resistance. Two specific species of fungi that can act as a parasite to insects have been identified as potential alternative control agents for lesser mealworm. Both fungi are natural pathogens of lesser mealworm and are not toxic to birds or mammals. In addition, both fungi species have been formulated into mycopesticides that have been registered in Australia and overseas.

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## Objectives

To develop a proof of concept for mycopesticide control of lesser mealworm populations in chicken meat broiler houses. A mycopesticide is a pesticide where the main active ingredient is composed of fungus.

## Research

Systematic laboratory and field investigations were undertaken to develop a proof-of-concept for mycopesticide control of lesser mealworm populations in chicken meat broiler houses. Endemic strains of the two identified species of fungi were screened in the laboratory for virulence to lesser mealworm. Methods for the mass production of spores of the selected fungal strains were optimised through improved growth mediums and harvesting techniques. The most pathogenic strains were

developed into wet or dry formulations for testing with different application methods. The most effective mycopesticide formulation for both fungi, a dry granular formulation, was tested in the laboratory for compatibility with broiler house substrates, including new and used poultry litter, and soil. The formulations were also tested across a range of temperatures and pH levels. Formulation efficacy tests were also undertaken against different lesser mealworm life-stages, including early and late development larvae, pupae, and new and older adult beetles. Two granular mycopesticide formulations, one based on each of the fungi species, were evaluated against lesser mealworm populations in broiler houses in a replicated, on-farm field trial over five chicken flocks. Untreated sheds and sheds treated with industry standard insecticides were included in the trials for comparison.



## Outcomes

Field trials conducted at a meat chicken farm in southeast Queensland showed that treatment of the broiler-house floor under feedlines and along walls with the granular mycopesticide formulations resulted in a significant suppression of lesser mealworm populations. One of the mycopesticide formulations performed better than the industry standard insecticides tested in parallel and the other mycopesticide formulation equalled the efficacy of the insecticides. The granular formulations based on fungal spores mixed with crushed chicken feed pellets were easily prepared and applied. A simple fertilizer spreader was used to apply 18kg of granular formulation to a broiler house floor in under 20 minutes. The optimised methods for producing fungal spores for use in formulations could easily be upscaled for commercial operations.

## Implications

This research offers a proof-of-concept for an alternative control measure for lesser mealworm that has a low environmental impact – mycopesticides. Incorporating mycopesticides into lesser mealworm management regimens offers a number of benefits to the Australian chicken meat industry including

a natural control agent that is safe for birds and operators, insecticide-free litter, and a reduction in overall insecticide usage, thereby delaying insecticide resistance and prolonging the useful life of insecticides.

## Recommendations

It is recommended that further research is conducted to generate data to support the registration of a mycopesticide for lesser mealworm control in Australia, and potentially internationally. The key areas of this research should focus on further evaluation of these mycopesticides in broiler house trials on farms with differing husbandry practices. The research should also assess the impact of season on formulation efficacy. In addition, co-application of the formulations with current industry insecticides should be evaluated for their potential interactions.

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