

Combined benefits: pollination & biological pest control in cotton

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What are you researching?

We are investigating the combined benefits that pollination and biological pest control have on cotton yield. Although the benefits of insects for pest suppression are clearly recognised and integrated in the Integrated Pest Management (IPM) program, the role of insect pollinators for Australian cotton had been less clear.

We conducted greenhouse and field experiments to quantify the net benefit of these two services to cotton and to understand how they affect yield. In the greenhouse experiment, we used mirids and hand pollination treatments. In the field experiment, we exposed sentinel cotton plants to the natural communities of pests and beneficials (pollinators, natural enemies of pests) and performed an experiment to quantify impact of beneficials through manipulation of their presence/absence.

Additionally, we used digital cameras to record images of cotton flowers during daylight hours (5am-7pm) to identify the main pollinators. This three-year CRDC funded research project is due for completion in August 2018.

What have you found?

We found that yield loss due to pests is lower with cross-pollination of cotton. Pollination did not benefit yield when the mirid pressure was low (0 or 1 per plant). However, when mirid pressure was high (5 per plant) pollination increased yield by almost 50 per cent (by increasing first position boll retention) in comparison to the pollinator exclusion treatment. Similarly, in the field study, excluding pollinators and

natural enemies of pests reduced boll retention by 12 per cent, but there was no yield loss when only natural enemies were excluded. Thus, pollination was sufficient to fully compensate the negative effect of pests on cotton boll retention in the field experiment.

Why is it important?

Enhancing biological pest control means less pests in the field, and simultaneously enhancing pollination means there is a possibility to reduce yield loss due to the remaining pests. This can allow options to maintain productivity while reducing agrochemical inputs, and thus reduce input costs



and secondary pest outbreaks, and promote agricultural sustainability, good stewardship and community well-being.

How can I apply the research/what should I do about it?

Fortunately, many land management practices that benefit biological pest control, also benefit pollination. Literature has shown that maintaining native vegetation in the landscape surrounding cotton fields is one way to promote these two ecosystem services. This is because they provide habitat and a refuge to the beneficial insects, particularly during the out-of-cropping season. Native vegetation in good condition (few weeds, structurally complex with high diversity of native plants) promotes these services, but it is also likely to reduce risks related to pests and weeds. Additionally, field management practices that harm these beneficial organisms (spraying) could be reduced and targeted at times of a day or season when the activity of these organisms is lower.

Where do I go for more information?

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Further reading:

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- Sutter L & Albrecht M. 2016 Synergistic interactions of ecosystem services: florivorous pest control boosts crop yield increase through insect pollination. *Proceedings of the Royal Society of London B: biological sciences.* p. 283.

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