



Services and dis-services of rainforest insects to crops on the Atherton Tablelands

Custard Apple Pollinators: Highlights of Case Study Progress

Most custard apple varieties grown in Australia require labour-intensive hand-pollination to produce sufficient quantities of well-formed fruit. Our study investigated the capacity provided by native beetles to pollination services.

WHY BEETLES?

In many parts of the world species of tiny nitidulid beetle perform the service of pollination for custard apple flowers. Before our study started only one of these beetle species had been recorded from Australian custard apples.

Honeybees can't provide this service because they are too large to enter custard apple flowers in the receptive female stage, when the petals are partly closed. In fact, honeybees disadvantage custard apples by stealing pollen from the flowers when the petals open fully in the male stage, when the flower is no longer receptive to pollination.

Tropical rainforest in far north Queensland has numerous plant species related to custard apple and some of these species have flowers that are similar to custard apple flowers. It seemed likely that pollinators of these species might also pollinate custard apple flowers.



Custard apple flower (female stage)



Tiny native beetles (all < 3mm long) found in custard apple flowers on the Atherton Tablelands

WHAT CONTRIBUTION DO THE BEETLES MAKE?

To test this idea we collected 100 female flowers from each of three custard apple orchards near rainforest ($\leq 200\text{m}$ away) and six custard apple orchards far from rainforest (10-40km away). Each flower was placed in a separate small plastic bag and frozen to preserve any insects present. The insects were removed, identified and the abundance of each species recorded.

We found that custard apple orchards on the Atherton Tablelands are visited by five non-native species of beetle with world-wide distributions and four native Australian beetle species. The non-native species are known pollinators of custard apple in other countries but the Australian native species have not previously been reported from custard apple.

On average non-native beetles were six times more abundant than native beetles in orchards far from rainforest, while native beetles were five times more abundant than non-native beetles in orchards close to rainforest.

The association of native beetles with rainforest suggests that these beetle species originate in rainforest, or use rainforest as a refuge or breeding place.

Other studies indicate that at least 4 beetles/flower are needed for pollination to be effective. No orchard we sampled had enough beetles to replace hand-pollination. The shortfall was greatest where native species were sparse.



WHERE TO NEXT?

We are continuing to evaluate of the ecosystem service provided by beetles in Atherton Tableland custard apple crops. We are exploring further the relationship of native species with tropical rainforest, estimating the proportion of pollination contributed by beetles, establishing numbers of beetles needed/flower for effective pollination and determining whether beetles can be maintained in the crop in fallen fruit.

WE WANT TO HEAR FROM YOU!

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