

Tui pollination of flax: a microbial perspective

Global pollinator decline has been touted as one of the worst biological tragedies in modern times – threatening pollination services and food production. Hidden components of the plant-pollinator interaction that could explain some of the discord in pollinator behaviour are the microbes that occupy floral nectar. Microbes can change nectar chemistry in ways that either promote or deter pollination, thereby shaping pollinator behaviour. Pollinators, already under duress from anthropogenic disturbances, may therefore negatively interact with plants containing undesirable microbes. However, we understand little about how these microbes exert their influence on pollinator behaviour, especially in anthropogenically disturbed environments.

Tui (*Prosthemadera novaeseelandiae*), an iconic New Zealand species, play a critical role in the cross pollination of flax (*Phormium tenax*). Flax produces copious amounts of nectar and is widespread throughout New Zealand. The tui-flax partnership is an ideal system to question the importance of nectar microbes in exacerbating or mitigating the impact of environmental change on the plant-pollinator relationship. First, we will identify the unique microbial signatures of tui pollination and quantify tui visitation to flax within natural systems – using a combination of video recordings and microbial community profiling. At three sets of paired sites in Tongariro National park, we will observe tui visitation. In this marginally disturbed habitat, we will also quantify nectar microbial community. These data will establish tui pollination microbial signature in natural ecosystems. We will compare these data with flax nectar samples collected in three sets of sites in Auckland, with different degrees of urbanisation. Here we will also collect samples from tui bills and use video recordings to quantify tui visitation to flax patches.

Overall, our data will ascertain whether tui-flax relationship has a characteristic floral microbiome and whether this microbiome is altered due to anthropogenic disturbances such as urbanisation. Together, these outcomes allow for deeper understanding of how nectar microbes and land-use type jointly affect pollinator foraging behaviour.



Photo: Tui (left) are a dominant pollinator of flax plants and bring microbes (R) to the nectar-filled flowers. Image credits: John Hunt, Manaaki Whenua Landcare Research (tui photo) and Manpreet Dhani, Manaaki Whenua Landcare Research (nectar microbe photo).