Chemical Communication Between *Bactrocera tryoni* and Associated Gut Bacteria

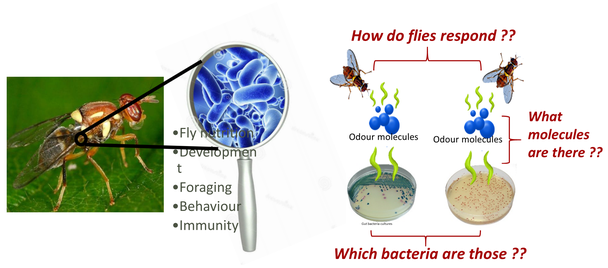
Nazma Akter Tithi*
School of Natural Sciences, Macquarie University, NSW 2109 Australia

Abstract

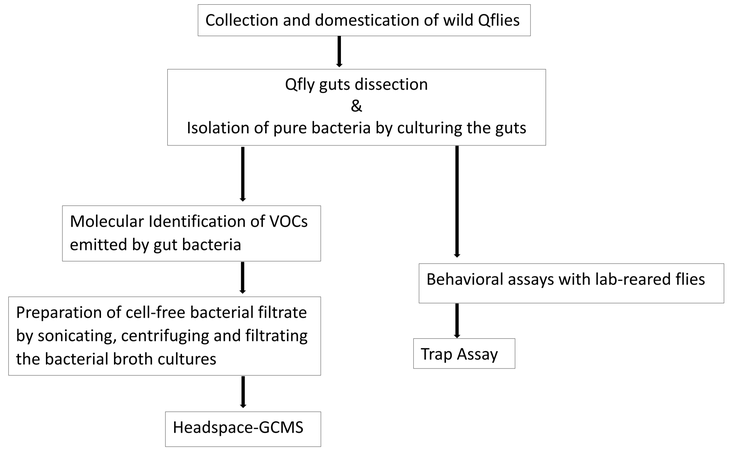
Relationships between tephritids and microorganisms have been a focus of entomological research particularly due to the potential use of microbial emissions in pest control. Symbiotic interactions between fruit flies and their associated gut bacteria have been well-studied, however, the composition of volatile chemicals from these gut bacterial emissions and their role as mediators of fruit fly behaviour is still underexplored. Here we hypothesise that the volatile emissions from fruit flies gut microbionts may attract host flies. To this end, we isolated culturable bacterial species, mostly belonging to the family Enterobacteriaceae, from the midgut of wild adult Queensland fruit fly (Qfly), *Bactrocera tryoni*, one of the most damaging horticultural pests in Australia. In a screening trap assay, both male and female adult *B. tryoni* were attracted to the odors emitted by most cultured isolates (1% to 25% of net attractancy). Among 100 tested isolates,four isolates significantly deterred adult male and female B. tryoni (-1.5% to -14%). Interestingly, one isolate attracted males (5%) but deterred females (-1.5%). Gas Chromatography-Mass Spectroscopy analyses revealed a number of microbial volatile organic chemicals (mVOCs) in the headspace of liquid cultures of isolated bacteria, including ketones, carboxylic acids, alcohols and S-methyl esters. This is an important step in understanding fruit fly-bacteria chemical relationships and its potential to develop attractants and potentially repellents for fruit fly pest management.

Objective

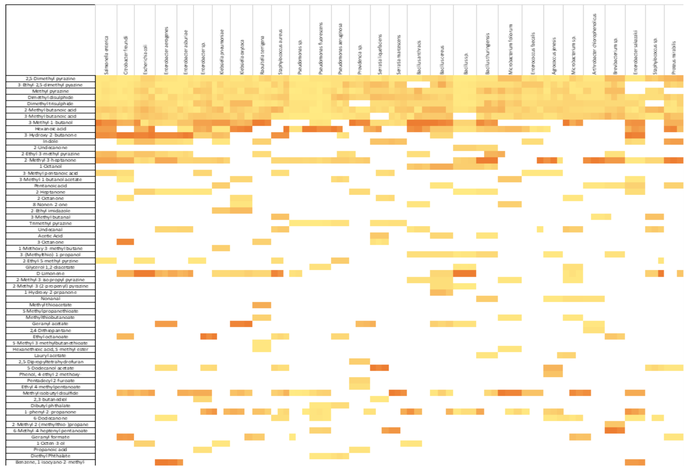
The overall aim of our study was to understand the knowledge gap in tephritid-gut bacteria association and to explore the potential of gut bacteria in Qfly behaviour. The strategy of our study comprised of three steps, starting with isolation and molecular identification of bacterial composition in the gut of wild adult Qfly. We then have evaluated the prominence of these bacterial species in adult attraction using trap behavioural assay and finally have conducted chemical analyses of these bacterial emissions to identify their volatile compounds.

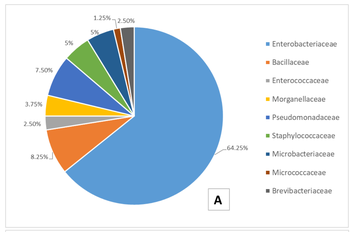


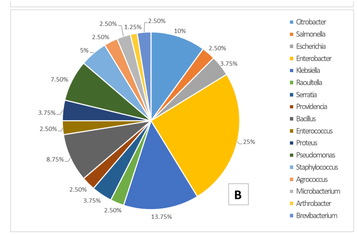
Methods

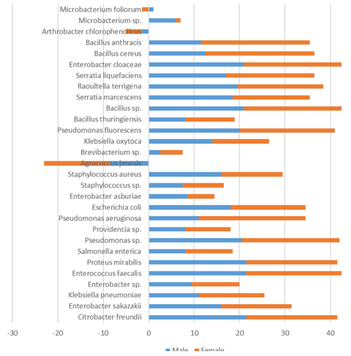


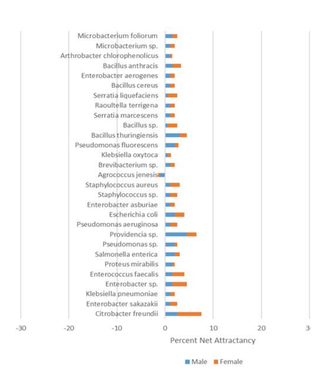
Results











Research Outcome

- Isolate and identify culturable bacteria from the gut of wild Qfly and evaluate the diversity in their gut bacterial community
- Evaluate the potential of isolated gut bacteria on the behaviour i.e. attraction/repellence of lab-reared young and matured male and female Qfly
- Identify the bacterial volatile organic compounds emitted from the isolated gut bacteria and determine the chemical compositions of attractive bacterial strains

Future Works

- Collection of mVOCs from attractive bacterial strains
- Investigate the electrophysiological responses of Qfly to mVOCs
- Evaluate the behavioural response of Qfly to individual or blend of EAD/EPG-active mVOCs

*nazma.tithi@mq.edu.au