

Applying bait sprays for FRUIT FLY CONTROL

International markets have zero tolerance for fruit flies in exported citrus. By **Aruna Manrakhan** (Citrus Research International) and **Chris Weldon** (University of Pretoria)

Given the strict market requirements when it comes to fruit flies, considerable effort is undertaken to suppress their populations in citrus orchards. Protein bait sprays, which are recommended for their effectiveness, are more commonly used than other protein bait application techniques such as bait stations and mass trapping. In addition to baiting, orchard sanitation is essential, and further suppression can be achieved using male-targeted attract-and-kill products.

Growers are advised to start fruit fly control measures in citrus orchards by February, or earlier if trap catches indicate high fruit fly abundance. However, in mandarin orchards, bait spray application becomes more complex. Ground-based sprays can cause phytotoxicity if droplets land on green fruit or fruit at colour break (i.e., before full colour development). These same sprays are generally safe once the fruit has reached full colour. Aerial application of bait sprays offers



Aruna Manrakhan



Chris Weldon

a safer alternative during the earlier stages of fruit development for mandarins.

There may be a temptation to apply bait sprays to the ground cover or the lower canopy of mandarin trees in order to avoid phytotoxicity on fruit at the green and colour break stages. However, recent research by Msizi Ramaoka, an MSc student in the Department of Zoology and Entomology at the University of Pretoria (funded by Citrus Research International), has found this approach ineffective. Using field cages placed over citrus trees (**Figure 1**), Ramaoka investigated the responses of two fruit fly pests of citrus – *Ceratitis capitata* and *Bactrocera dorsalis* – to protein baits placed at different canopy heights and on the ground. In the inset, *Bactrocera dorsalis* individuals are feeding on Hymlyure droplets applied to filter paper, which was suspended at mid-canopy level. Ramaoka tested males and females of the two species, younger and older flies of these species, and adult flies that had a protein meal before the tests and those that did not.

Ramaoka's findings

- Significantly higher fly responses to protein baits placed in the mid to upper canopy.
- Minimal responses to baits placed on the ground.
- Females responded more than males to protein baits.
- Older flies were more responsive than younger ones.
- Flies that had a protein meal before the tests were less responsive than those that did not.
- *C. capitata* generally showed greater attraction to baits than *B. dorsalis*, although the difference was not statistically significant.
- Bait responsiveness was highest under temperatures of 20–30°C and relative humidity of 40–80%.

Suggestions for bait spray application in citrus orchards

- Target the mid to upper canopy, where flies are most responsive (Refer to the tick marks in **Figure 1**).

- Increase the frequency of bait applications when there are abundant natural protein sources for flies, such as honeydew from pests like mealybugs, Australian bug and woolly whitefly.
- Schedule applications during optimal environmental conditions, when temperatures are between 20 and 30°C.

Specific recommendations for mandarin orchards before fruit reaches full colour

1. Do not apply bait sprays to the ground in an attempt to avoid phytotoxicity; it's ineffective.

2. Use bait stations or aerially apply bait sprays to minimise the risk of droplets landing on fruit.

The details of this study are freely available

Ramaoka, M.R., A. Manrakhan, C.W. Weldon. 2025. *Responses of fruit flies (Diptera: Tephritidae) to protein bait: Effects of tree canopy, species, physiological state and weather*. Crop Protection, 197 (107331). <https://doi.org/10.1016/j.cropro.2025.107331>.

Apply protein bait sprays to the mid and upper tree canopy

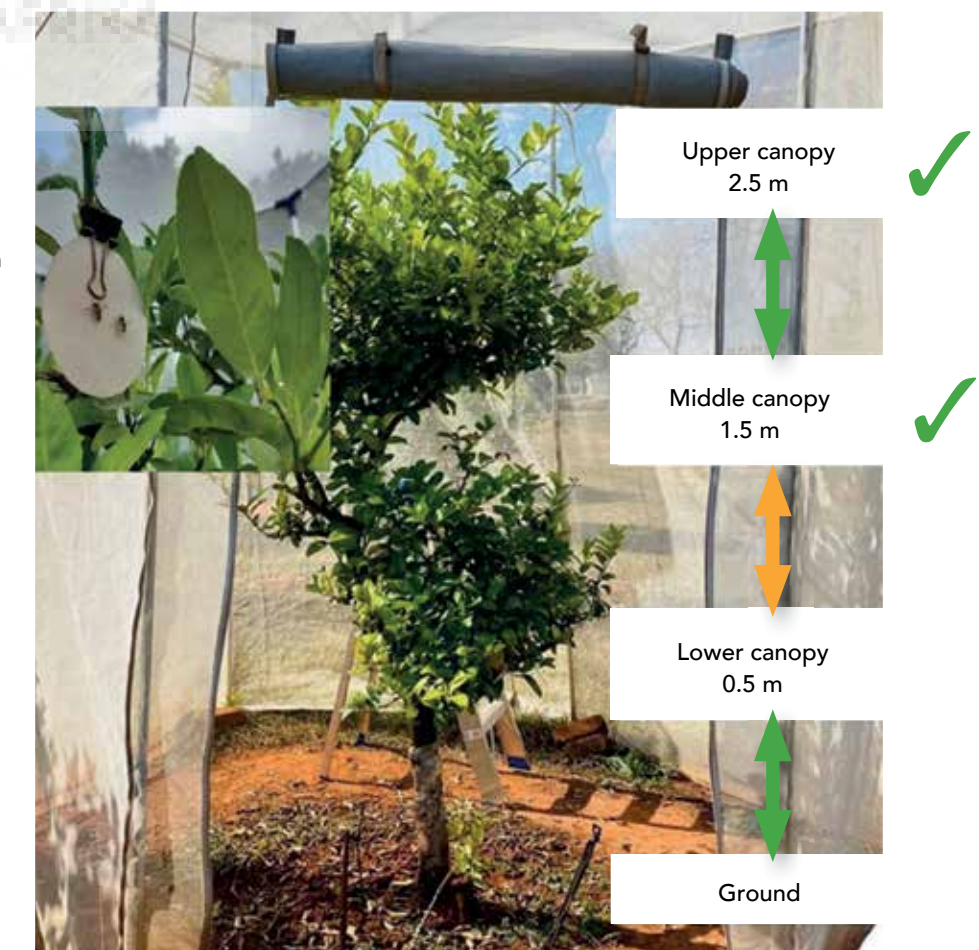


Figure 1. Experimental setup used to assess fruit fly responses to protein baits



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