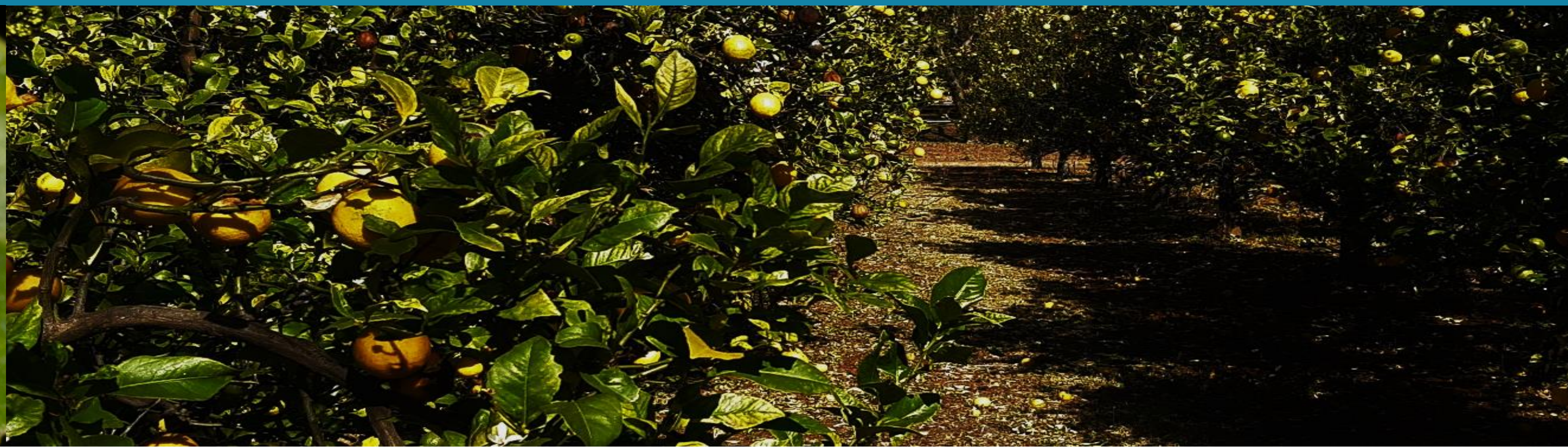


# Patterns of foraging for protein by fruit fly pests in citrus in South Africa

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Mediterranean fruit fly, *Ceratitis capitata* © N. Parry

Oriental fruit fly, *Bactrocera dorsalis* © A. Coetzer

## Introduction

Application of protein baits as sprays or stations forms the core of fruit fly control measures in orchards because they can be applied rapidly, have a limited effect on natural enemies, and limit insecticide residues on fruit.

Sexual development, nutritional state, age and gender may all lead to physiological differences that can reduce the efficacy of proteinaceous baits.

We investigated the spatial and temporal foraging patterns of fruit flies for protein baits within a citrus tree with regard to fly age, sex and nutrition.

## Materials and methods

Tested flies were from cultures of *Ceratitis capitata* and *Bactrocera dorsalis* held at the University of Pretoria.

We fed females and males sugar or sugar and hydrolysed yeast for their entire lives.

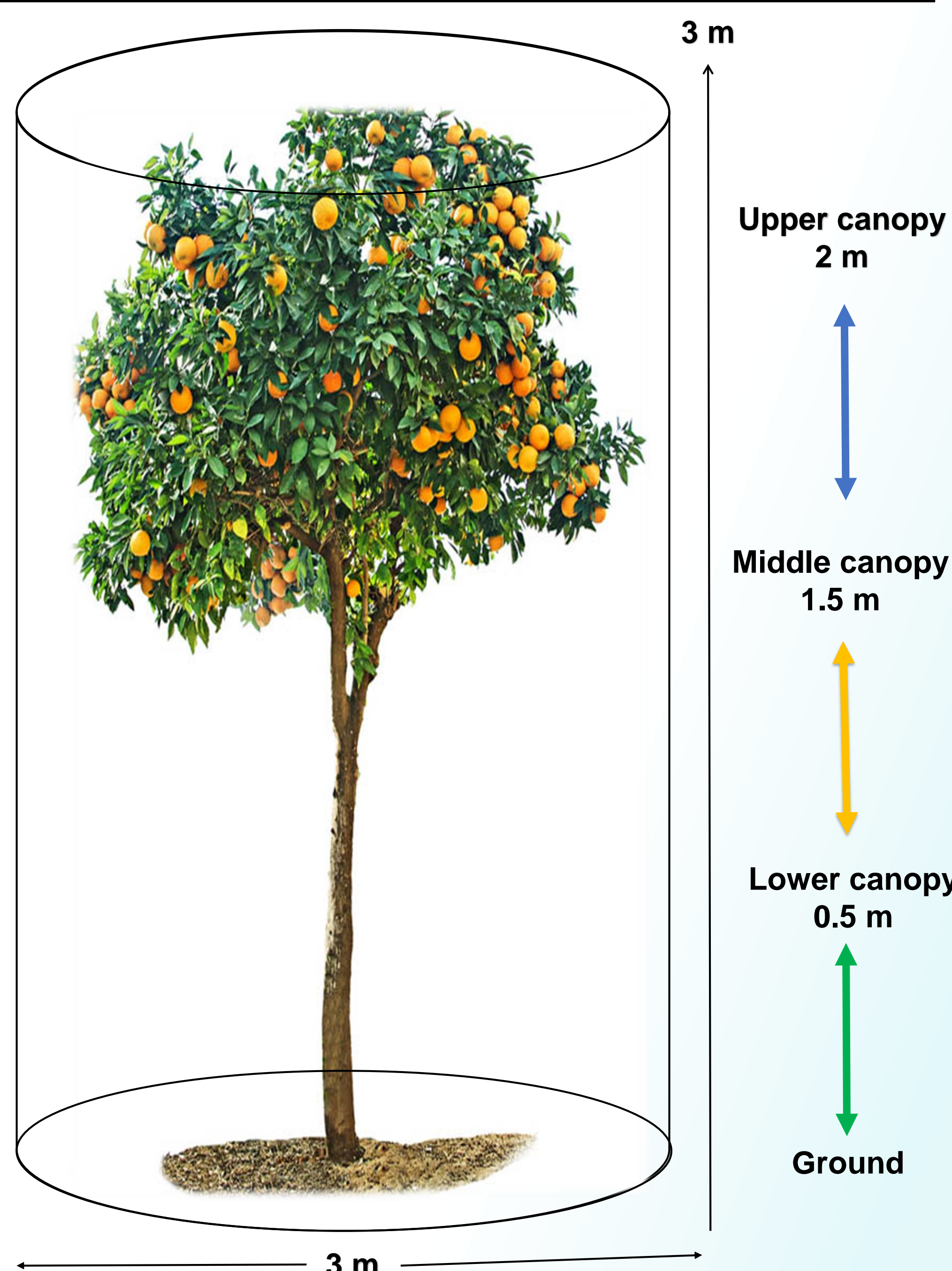
At ages of 1 and 10 days, ten flies of the same species, sex, and diet were released into one of two white hexagonal field cages erected over established, planted lemon trees on the UP Innovation Africa campus. The cages were located 20 m apart to minimize potential interference between traps.

The released flies were left to explore and acclimatise to conditions in the field cages for 1 hour before a bait station was introduced.

A bait station was placed in different canopy levels of the tree. Flies that responded during a one hour period were recorded and removed.

Observations took place at 10h00-16h00 when temperatures were above 20 °C. To date, a total of 121 out of a planned 960 tests have been completed.

To record environmental conditions, each cage contained a 3D printed Stevenson screen fitted with a temperature and relative humidity data logger.



## Key findings

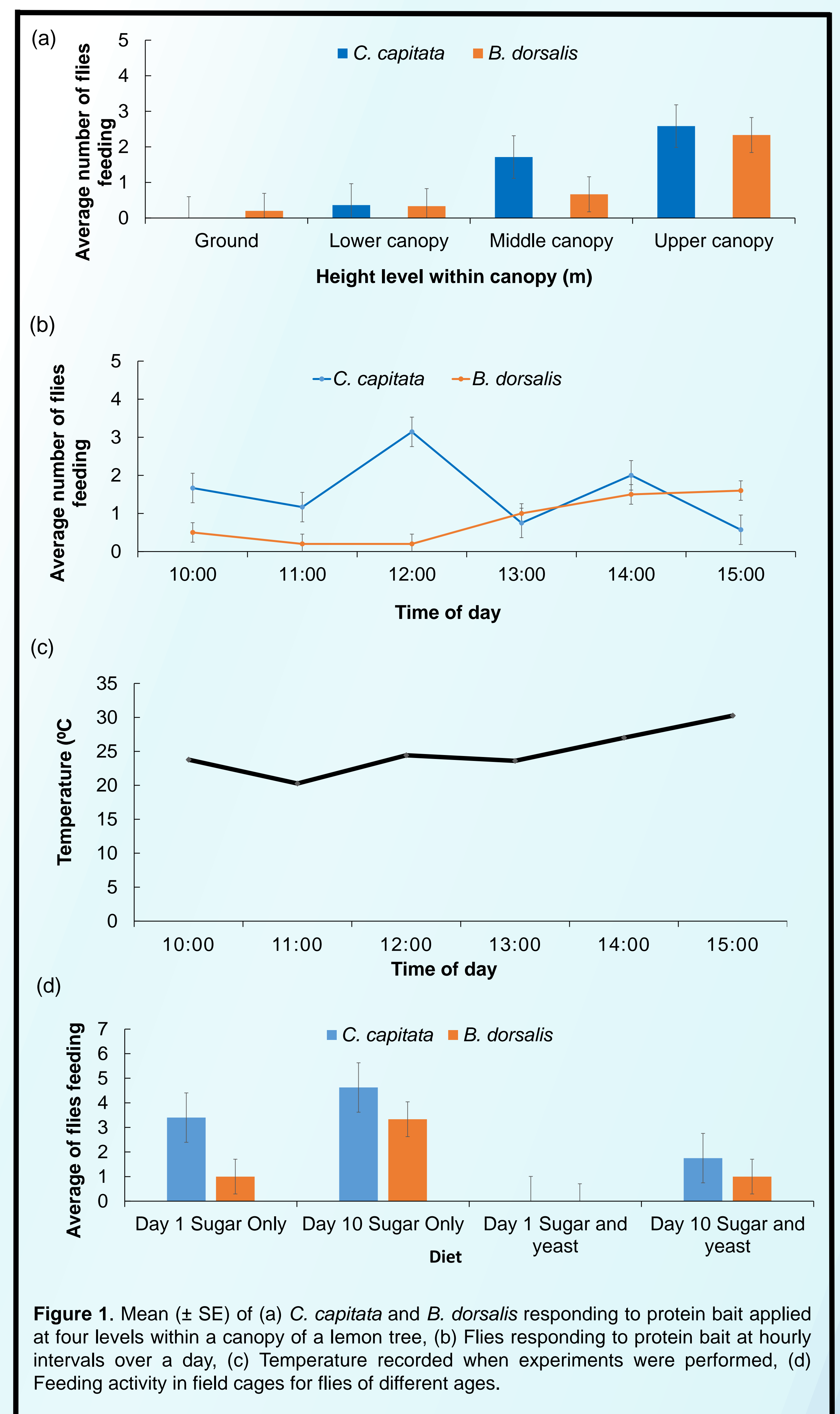
Observations show that the location of bait in the canopy affects response by *Bactrocera dorsalis* and *Ceratitis capitata*, with more flies foraging on protein in the mid to upper canopy levels.

Results show that protein bait applied on the ground in citrus orchards attract fewer fruit flies than when applied within the tree canopy.

Temperature and relative humidity had an effect on the bait response by all flies with fly maneuverability increasing in the warmest part of the day between 12:00–15:00.

Nutritional status, sex and age also affect protein foraging, with 1 day-old male and females with prior access to protein being less responsive to protein bait, while 10-day-old protein-deprived females intensely forage for protein than males.

**For fruit fly control, apply protein baits in citrus canopy for higher efficacy. Avoid placing baits on the ground**



**Figure 1.** Mean ( $\pm$  SE) of (a) *C. capitata* and *B. dorsalis* responding to protein bait applied at four levels within a canopy of a lemon tree, (b) Flies responding to protein bait at hourly intervals over a day, (c) Temperature recorded when experiments were performed, (d) Feeding activity in field cages for flies of different ages.

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