Preventative sterile fly release for the management of a Mediterranean fruit fly outbreak in South Australia

C.J. Smallridge* & D.C. Hopkins
Entomology Unit, Waite Precinct, South Australian Research and Development Institute, GPO Box 397, Adelaide, SA, Australia, 5001

Although largely a fruit fly-free zone, Adelaide is commonly subject to outbreaks of Mediterranean fruit fly during the spring and summer months. In previous years, control methods using chemical insecticides have been implemented to eradicate incursions. In the spring/early summer of 2001, roving release methods were used to distribute sterile flies across an area of Adelaide (20 km²) that had been the centre of an outbreak earlier in the year. The resulting fly distribution is presented along with preliminary data on fly dispersal and trap efficiency from colour-differentiated experimental releases.

INTRODUCTION

Although South Australia is fruit fly-free, its capital Adelaide sometimes has outbreaks of Mediterranean fruit fly which probably originate from established populations in Western Australia. In previous years, eradication has been based entirely on the use of chemical insecticides (bait and cover sprays). In December 2000, a series of outbreaks coalesced across an area covering 20 km² and lasted for six months. As a result of increased public resistance to the chemical method of eradication, cover-sprays were omitted during the final two months of the eradication programme. Owing to the possibility of an over-wintering population existing in the area, pre-emptive roving releases of sterilized Vienna 7/Mix 99 tsl males were made in the early spring/summer of 2001 (September–December) in order to suppress the reproductive success of any emerging adults.

MATERIALS AND METHODS

Production of pupae

The Western Australian Department of Agriculture produced the pupae which were sterilized (Co²⁰, 180 Gy, in nitrogen), marked with Fiesta fluorescent powder and air-freighted to Adelaide on a daily basis.

Sterile fly maturation

Fourteen grams of pupae (approximately 1700 pupae) in paper bags were placed in 5-l cardboard tubs (one paper bag per tub) with 40 ml sugar/agar. Tubs were held at 25°C, 65% RH, and 14:10 L:D until release three days later. Samples of pupae were taken from every batch for quality control (QC) tests (FAO, IAEA & USDA 1998). Overall average post-shipping QC results were: pupal weight 8.3 mg; emergence 75%; and flight ability 72%.

Release and recapture

The entire release area was made up of six adjacent rectangular areas of approximately 3.4 km² (1.4 × 2.4 km) which were each treated every third day with 210–220 tubs of flies. Tubs were opened on the back of a moving vehicle every 160 m along a 32- to 35-km route which wound through the suburban street grid. Capilure-baited Lynfield traps on a 400-m grid (i.e. 20–24 traps per area) were checked weekly for 12 weeks. Captured flies were examined under a UV-illuminated microscope for dye in the ptilinum.

Grid calibration and distribution analysis

To calibrate grid efficiency, a total of 10 trials were conducted in three of the release areas following the method of Fletcher (1974). Each release area was treated with a known number of distinctly dyed fliers (pupal numbers adjusted according to flight-ability quality control results) on a different day and the traps in each treated area were cleared after 24 h. This procedure minimizes the time that flies may be lost to emigration or mortality before obtaining an estimate of the recapture rate over the 24 h period. Recapture rate was calculated as the proportion of released fliers that were recaptured.

The average and range of flies per trap per week rate within the entire release area was determined fortnightly, as well as the relationship between total recapture number and distance beyond the release area to 14 January 2002.

*To whom correspondence should be addressed.
E-mail: smallridge.catherine@saugov.sa.gov.au
RESULTS

In total, 38.8 million fliers were released into the area over a 12-week period, and the average recapture rate from the grid calibration trials was 0.15% per day (range 0.05–0.32%).

The average number of flies caught per trap per week was >100 after four weeks, and stabilized at more than 200 flies per trap per week after six weeks (Fig. 1). Catch per trap per week ranged from 0 to 2094, but after the first fortnight, 75–88% of the traps caught between 100 and 600 flies per week.

In total, 347,454 flies (0.9%) were trapped within 1 km of the entire release area; 7639 flies (0.02%) were trapped 1–10 km away (Fig. 2), and 224 flies (0.0006%) were trapped >10 km from the entire release area.

SUMMARY

• The calibration trials estimated the grid efficiency to be 0.15%. Calibration trials will be conducted routinely during future releases to determine grid efficiency variability under different conditions.
• The three-day release cycle using the roving release method was successful in maintaining a high density, homogeneous distribution of sterile male flies in the Adelaide suburbs.
• A small proportion of released flies was trapped >10 km from the release area. The relationship between distance and recapture number \( y = 14.2x^{-1.3} \) was similar to that reported by Wong et al. (1982) over shorter distances.
• No wild Mediterranean fruit flies were trapped in Adelaide in the summer of 2001/2002. It was not
possible to ascertain if reproductive suppression was achieved, or if no overwintering population of flies had emerged.

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