EVALUATING A NEW TRAP DESIGN FOR THE SURVEILLANCE OF QUEENSLAND FRUIT FLY *BACTROCERA TRYONI* (FROGGATT) (DIPTERA: TEPHRITIDAE) IN SOUTHERN AUSTRALIA.

Colin Bain,[1] and Bernard C. Dominiak[2*]

[1] Bio-Trap Australia Pty Ltd, Roditis Drive, Ocean Grove, Victoria, 3226, Australia.
[2] NSW Department of Primary Industries, The Ian Armstrong Building, 105 Prince Street, Orange, New South Wales, 2800, Australia
[*] Corresponding author
Email: bernie.dominiak@dpi.nsw.gov.au

Summary

Fruit fly surveillance remains important for international and domestic trade. The cuelure baited dry Lynfield trap has been the standard since the early 1990's. Here, we tested the Biotrap (two versions) and two other internationally recognized traps (Susbin trap and Multi lure trap) against the Lynfield trap. There were no statistical differences and all traps were equivalent to the Lynfield trap under our test conditions.

Keywords: monitoring, Biotrap, Lynfield, Susbin, multi lure, market access

INTRODUCTION

Tephritids are a pest of fruit crops and an impediment to trade throughout the world (Vargas et al., 2015). In Australia, Queensland fruit fly (Qfly), *Bactrocera tryoni* (Froggatt), is the main pest of most tree crops and some vegetables along the east coast (Dominiak and Mapson 2017). Lures are essential for surveillance and tephritids are attracted to lures (Suckling *et al*. 2016). Cuelure was found to be an attractive male lure for many species including Qfly (Monro and Richardson 1969). The search for new lures continues but cuelure remains the standard (Royer *et al.* 2017). Additionally, trap architecture is important in surveillance and continues to evolve. Jackson traps (delta design using sticky mats) baited with cuelure were used in the late 1980's in New South Wales (NSW). Cowley et al (1990) demonstrated the Lynfield traps were superior to the Jackson traps and subsequently Lynfield traps became the standard trap design in southern Australia (Dominiak *et al*. 2003). However, cuelure baited Lynfield traps only trap male Qfly. The protein baited McPhail traps do attract both males and females but are only about one seventh as effective as Lynfield traps for male Qfly (Dominiak and Nicol 2010).

Regarding trap architecture, Jackson traps were replaced by Lynfield traps in the 1990's. Cone traps were demonstrated to have some advantages over Lynfield traps in certain circumstances and are used in some areas (Dominiak *et al.* 2019). Additionally, Ladd traps were assessed in Queensland (Schutze *et al.* 2016). Wicks are commonly used by growers and are the current Australian trade standard. The wafer is increasingly being used by industry for surveillance but is not accepted for international trade. However, the dry Lynfield traps (males) using wicks baited with cuelure, and wet protein baited MacPhail traps (female), remain the standards for international trade (Dominiak and Nicol 2010). Here, we conducted an initial evaluation to demonstrate that Biotraps were equivalent to the Australian standard Lynfield trap.

MATERIALS AND METHODS

The trial (six treatments – see Table 1) was conducted on an apple orchard, Biodynamic Orchard, at Merrigum in Victoria between 2 February and 10 April 2017. The Lynfield trap (Figure 1) was manufactured by Biotrap Pty Ltd, Australia in their Victoria facility. The Multitrap (Figure 2) was manufactured by Better World Manufacturing Inc. Fresno, California, USA. The Susbin trap (Figure 3) was provided by Susbin S.R.L., Mendoza, Argentina. Two versions of the Australian designed and made Biotrap (V1 & V2) (Figure 4 and 5) were manufactured by BioTrap Pty Ltd. The Biotrap V1 was tested with wick (V1 wick) or wafer (V1 wafer) to hold the cuelure and malathion. The Biotrap V2 was tested only with the wick. The wafer was supplied by Farma Tech International Corporation, North Bend, Washington, USA. Wafers (Mallet CL from Farmatech USA) contained 2 gm cuelure and 0.5 gm maldison. All other treatments used wicks. Wicks contained 4 gm of cuelure plus 0.5 gm maldison.

There were five replications for each treatment and treatments were about 40 m apart on every eighth tree. Traps in each block were rotated fortnightly. Flies in traps were identified and entered into a spreadsheet for statistical analysis. Raw data is presented as the number of flies trapped per trap per inspection period. Data were analysed in Genstat version 18.1 using Reml repeated measures with a natural log transformation to produce an even distribution of residuals from the mean. Fixed terms were date, treatment and date.treatment interaction.

RESULTS

Table 1. Trap catches of male Qfly in six traps over seven trapping dates.

Dates in 2017	Trap Types					
	Biotrap			Lynfield wick	Multilure wick	Susbin wick
	V1 wafer	V1 wick	V2 wick			
6 Feb	1.19 (2.4)	1.292 (2.8)	1.418 (3.2)	1.245 (3.0)	0.957 (2.0)	0.774 (1.4)
13 Feb	1.245 (3.0)	1.316 (3.0)	1.146 (3.8)	1.464 (3.6)	1.691 (4.8)	1.079 (3.2)
20 Feb	1.705 (4.8)	1.467 (3.4)	1.844 (5.4)	1.651 (4.4)	1.695 (5.4)	1.295 (4.0)
6 Mar	2.752 (16.6)	2.185 (8.6)	2.836 (16.6)	2.532 (14.8)	2.175 (10.6)	2.449 (13.6
13 Mar	2.826 (17.6)	2.333 (9.6)	2.681 (15.0)	2.718 (14.4)	2.745 (15.2)	2.488 (12.2)
27 Mar	3.49 (34.6)	3.143 (26.0)	3.235 (25.2)	2.948 (20.2)	3.205 (24.4)	3.165 (24.6)
10 Apr	2.429 (11.8)	2.51 (11.6)	2.551 (14.4)	1.971 (7.0)	2.498 (12.2)	2.736 (16.4)
Average number of Qfly	2.234 (12.97)	2.035 (9.29)	2.244 (11.94)	2.075 (9.63)	2.138 (10.66)	1.998 (10.77)

Data transformed with natural log and analysed by repeated measures in Reml using a power model. Original data (the number of flies trapped per trap per inspection period) is in brackets.

There were significant differences between dates (P=<0.001) but no significant differences (P=0.07) between treatments (Table 1). There was no significant differences in the date.treatment interaction (P=0.173). For the individual data, Lsd (P<0.05) within treatments = 0.569; within date = 0.635; across treatments and dates = 0.637. For the averages for each trap, F Pr=0.077; Lsd (Pr<0.05) = 0.201: SE= ±0.102.

Although the analysis showed no difference between the traps at a 5% level of significance, there was a strong tendency for fewer fruit fly to be caught in the Susbin wick trap compared to the Biotrap V2 wick and Biotrap V1 wafer. There was a strong tendency for the Biotrap V2 wick to catch more fruit fly than the Biotrap V1 wafer, particularly on 6 March.

DISCUSSION

There has been a concern by some trap inspectors that Qfly may have entered but left the Biotrap V1 before dying. However, we found no significant difference between this trap and Biotrap V2, or the three other traps. We conclude that the newer version of the Biotrap V2 was a suitable replacement for the older version (V1) and compared favourably to the other international traps. Furthermore, the two Biotrap variants were not significantly different to the standard Lynfield trap and may be used after confirmation with market access authorities.

ACKNOWLEDGEMENTS

The Lynton Greenwood (Greenwood Biodynamic Orchard) is thanked for hosting this trial on their property. Steve Booth of GV Environmental Monitoring Services, Tatura, conducted the trap monitoring and insect identification. Susanna Turpin conducted the statistical analysis. Lloyd Kingham and Bev Zurbo reviewed an early version of the manuscript. Lloyd Stringer and Rory MacLellan reviewed the manuscript for the journal.

Figure 1. Lynfield trap with wick.

Figure 2. Multi lure trap.

Figure 3. Susbin trap.

Figure 4. Biotrap V1 with wafer.

Figure 5. Biotrap VV2.

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