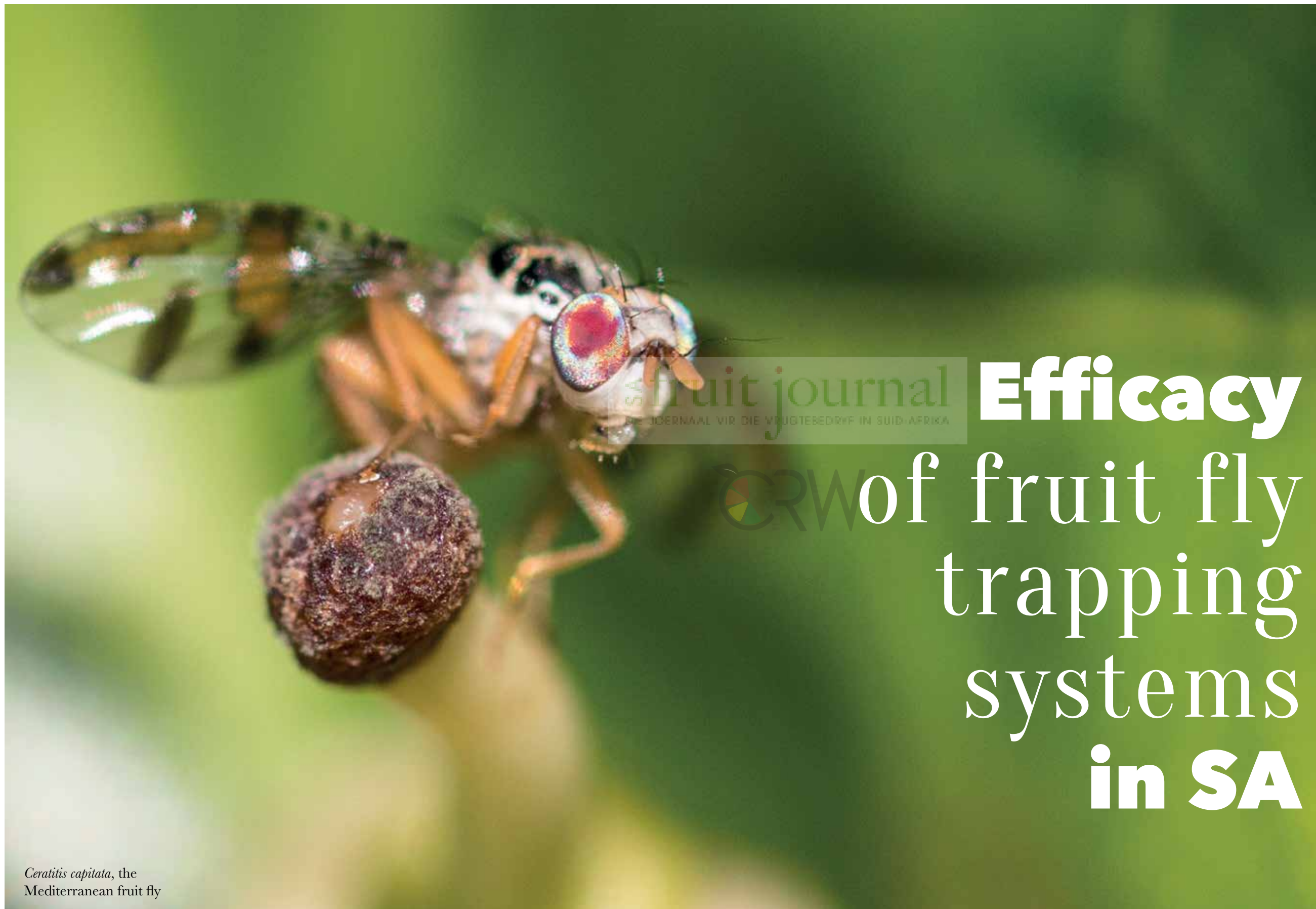




Ceratitis capitata, the
Mediterranean fruit fly

SA fruit journal
DE JOERNAAL VIR DIE VRUGTEBEDRYF IN SUID-AFRIKA



Efficacy of fruit fly trapping systems in SA



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There is a zero tolerance of fruit fly (Diptera: Tephritidae) pests in commercial fruit exported from SA. Commercial fruits in the country are affected by different fruit fly species. The most widespread indigenous fruit fly pest in SA is *Ceratitis capitata* (Wiedemann), the Mediterranean fruit fly (Medfly), which affects various fruit types. In 2013, an invasive fruit fly pest: *Bactrocera dorsalis* (Hendel), the Oriental fruit fly, was declared present in the northern parts of the country. The Oriental fruit fly still has a restricted distribution in SA, being mainly in the northern and north-eastern areas of the country.

In citrus orchards, effective management of fruit fly pests is required to prevent infestation of susceptible citrus types. Fruit fly management is carried out by (1) trapping to monitor adult pest populations, (2) application of attract-and-kill products for control of free-living adult stages and (3) orchard sanitation for removal of fruit, potentially infested with eggs and larvae. Because of the zero tolerance of fruit flies in fruit, the start of application of fruit fly control on a citrus farm is more or less fixed in time (months of the year): annually, between December and February,

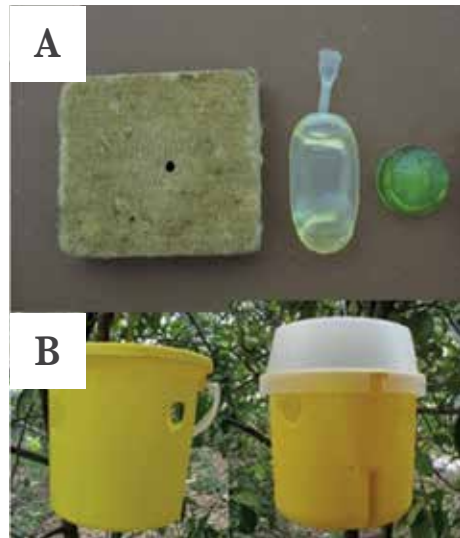


Figure 2. TML trapping systems evaluated in citrus orchards in Mpumalanga Province and deciduous fruit orchards in the Western Cape Province: (A) TML polymeric plug baited yellow Delta trap, (B) Capilure baited Sensus trap

depending on the citrus production region. Once control is initiated, applications are carried out throughout the season until harvest and should be adjusted based on trap catches. For trapping systems (combinations of traps and attractants) that are registered, threshold levels of fruit fly catches were established in citrus. These thresholds are used as the baselines for adjustments of fruit fly control practices. Adherence to these thresholds is important for reducing the risk of fruit fly infestation of fruit. When catches of fruit flies in a trapping system stay below a threshold level – implying a lower risk of fruit infestation – frequency of control can be maintained or even reduced. When catches are above a threshold level – implying a higher risk of fruit infestation – frequency of control should be increased and changes in products applied should be considered (e.g. addition of bait sprays if bait stations were applied).



Figure 1. (A) ME dispensers in trapping systems evaluated (from left to right): Invader Lure, ME Pherolure, ME polymeric plug and (B) Trap types in trapping systems evaluated (from left to right): Lynfield trap and Chempac Bucket trap

In a fruit fly trapping system typically used in SA, there are four components: (1) an odour-based attractant targeting either males of a specific group of species (male lures) or males and females of different fruit fly pests (general food-based lures), (2) a material dispensing the attractant (dispenser) (3) a retention mechanism (e.g. insecticide or sticky insert) for attracted insects and (4) a trap body for containing the dead insects. Variation in efficacy of a trapping system can be expected when one or more of its components change.

A field study was conducted to determine the efficacy of registered trapping systems for males of Medfly and Oriental fruit fly.

Materials and methods

Studies were carried out between March and April 2017 in three commercial orchards in each of two provinces: Mpumalanga and Western Cape in SA. Only citrus orchards were used in Mpumalanga Province; in the Western Cape Province a plum orchard, a table grape vineyard and a mixed orchard (plum and table grape) were used.

Trapping systems based on two categories of male lures were evaluated: Trimedlure (TML), targeting Medfly males, and methyl eugenol (ME), targeting oriental fruit fly males.

In each orchard in each province, two

TML based trapping systems (Fig. 1) were compared: (1) TML polymeric plug (Chempac fruit fly lure, Chempac, containing 1.0 g TML) in a yellow Delta trap (Chempac), (Fig. 1 A) and (2) Capilure (Capilure, Green Trading, containing 1.1 g TML) capsule in Sensus trap (Green Trading) (Fig. 1 B). No insecticide was used in the yellow Delta trap and the retention mechanism for attracted flies was a sticky insert placed on the floor of the trap. In the Sensus trap, a 3.0 g dichlorvos-impregnated strip was placed inside to kill any attracted flies.

In each orchard in Mpumalanga Province, three commercially available ME based trapping systems were compared: (1) ME in fibreboard block (Invader Lure, River Bioscience, containing 15.0 g of ME) (Fig. 2A) in Lynfield trap (Fig. 2 B), (2) ME in polyethylene bulb (ME Pherolure, Insect Science, containing 2.0 g of ME) (Fig. 2A) in Chempac bucket trap (Chempac) (Fig. 2B), (3) ME polymeric plug (Chempac ME lure, Chempac, containing 4.0 g of ME) (Fig. 2A), in Chempac Bucket trap (with a hole at the bottom of the trap). In each of the above traps, a 3.0 g Dichlorvos strip was placed inside to kill any attracted flies.

There were six replicates of each trapping system (treatment) in an orchard. In a replicate, treatments were set on different

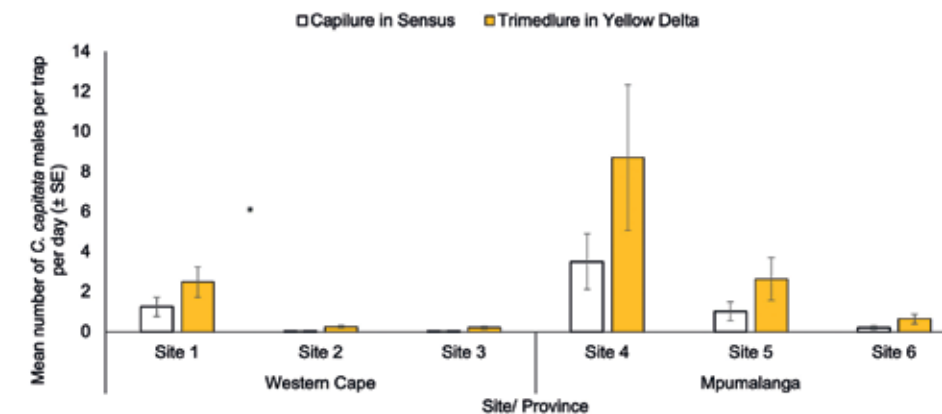


Figure 3. Captures of *C. capitata* males in Capilure baited Sensus trap and TML baited yellow Delta trap at study sites in the Western Cape and Mpumalanga Provinces in SA

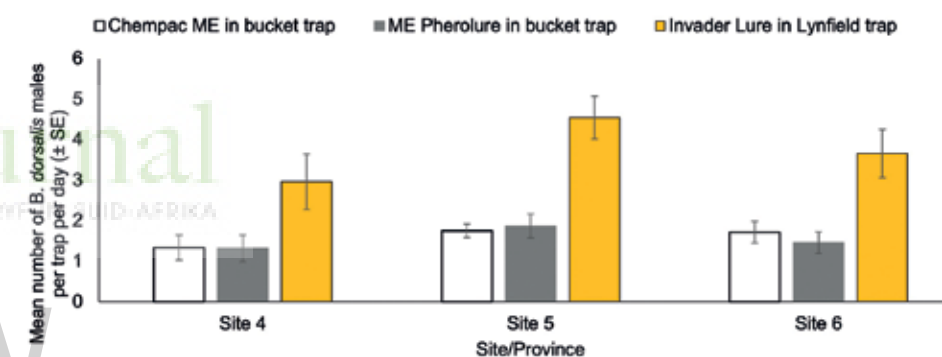


Figure 4. Captures of *B. dorsalis* males in three ME trapping systems: Chempac ME lure in Chempac bucket trap, ME Pherolure in Chempac bucket trap, Invader lure in Lynfield trap at three study sites in Mpumalanga Province in SA

trees, at least 50 m apart. Replicates within an orchard were in separate blocks spaced at least 200 m apart. Traps were placed on trees about 1.5 m above ground and shady parts of the canopy were selected. During each experiment, each trap was checked weekly for four consecutive weeks. Each week fruit flies were collected from the traps, placed in a vial and brought back to the laboratory for identification of species and sex, and counted. The dispenser and dichlorvos were not replaced for the four-week trapping period.

Results and discussion

Catches of Medfly males in the TML baited

yellow Delta trap were two to seven times higher than those in the Capilure baited Sensus trap depending on site (Fig. 3). The better performance of the TML baited yellow Delta trap could be due to the trapping system allowing a higher release of TML in the environment, or the ease of entry. The more open structure of the Delta trap compared to the Sensus trap would allow for a better diffusion of odour. The TML dispenser used with the Delta trap might have had a higher release rate of TML compared to Capilure, which contains TML plus an extender (Leonhardt et al., 1984). The addition of the extender to TML was previously found to reduce its release

rate (Leonhardt et al., 1984). It is also possible that Dichlorvos used in the Sensus trap could have reduced overall efficacy of the system. In a study done by Manoukis et al., (2016), a decrease in efficiency of a TML baited trap was found when an insecticide was included in the trap. Our findings confirm the use of a lower threshold for Medfly males in Capilure-baited Sensus trap (four per trap per week) compared to TML baited yellow Delta traps (eight per trap per week).

Average catches of Oriental fruit fly males in Invader Lure baited Lynfield traps were two to three times higher compared to the other ME trapping systems evaluated (Fig. 4). The Invader Lure dispenser contained four to eight times more ME by weight compared to the other dispensers. Previous studies have reported increased responses of oriental fruit fly males to increased amounts of ME (Shelly et al., 2011 and 2013; Suckling et al., 2008). Currently, there is a threshold level of three oriental fruit fly males per trap per week (with corrective actions already implemented at an average of 2.5 flies per trap per week). This threshold level applies irrespective of the ME based trapping system used. The results of this study suggest that the threshold level for the Invader Lure baited Lynfield trap should be 1.6 times higher than those set for the

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bucket traps baited with either the ME polymeric plug or ME in polyethylene bulb.

Trapping provides important information for effective management of fruit fly pests. Trap data are similar to market indices that investors follow regularly to make investment decisions. Therefore, growers should diligently implement a fruit fly trapping programme on their farm and in the greater area. Data acquired from the trapping programme should then be analysed regularly to make prompt decisions on fruit fly control. The type of trapping system used should be considered when analysing trapping data for decision making with regard to fruit fly control. Thresholds applicable for registered trapping systems in citrus in Southern Africa are provided in the Citrus Research International Production Guidelines (available at <https://www.citrusres.com/>).

Acknowledgements

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trap types for monitoring of *Ceratitis capitata* and *Bactrocera dorsalis* (Diptera: Tephritidae)." *Pest Management Science* 77: 2219-2230.]

Abstract

A study was carried out to compare the efficacy of trapping systems targeting the males of two key fruit fly pests in SA: Medfly (an indigenous pest) and Oriental fruit fly (invasive pest established in the northern and north-eastern areas since 2013). Catches of Medfly males were found to be higher in a Trimedlure baited yellow Delta trap compared to a Capilure baited Sensus trap. Catches of Oriental fruit fly males were higher in the Lynfield trap baited with 15 g of methyl eugenol (ME) (Invader Lure) compared to bucket traps with a dispenser containing either 2 or 4 g of ME.



Bactrocera dorsalis (Hendel), the Oriental fruit fly



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