FRUIT FLY
Ceratitis (Ceratitis) capitata (Wied.)
Ceratitis (Pterandrus) rosa Karsch
Bactrocera (Bactrocera) dorsalis (Hendel)

1 PEST PROFILE

1.1 Distribution and status

Three fruit fly species pose a serious threat to citrus in southern Africa. Two of the fruit fly pests, Mediterranean fruit fly (Medfly), Ceratitis (Ceratitis) capitata (Wied.), and Natal fly, C. (Pterandrus) rosa Karsch, are indigenous and widely distributed across South Africa. The third fruit fly pest – Oriental fruit fly, Bactrocera (Bactrocera) dorsalis (Hendel), is an exotic species which was recently introduced in the north and north eastern areas of South Africa. The pest is still considered absent in selected district municipalities in Mpumalanga, North-West, KwaZulu-Natal and Gauteng as well as the Eastern Cape, Western Cape, Northern Cape and the Free State Provinces. The three fruit fly species are pests of quarantine importance.

1.2 Description

Adults of the two Ceratitis flies have characteristic features of which the swept-back wings with their smoky yellow and brown markings and bright, blue-green eyes are the most readily noted. The Medfly is generally smaller than the Natal fly which has a body length of some 5 to 6 mm. The colouration of Natal flies tends towards brown and is generally darker than that of Medflies. The upper thorax of the latter has a readily visible pattern of black and silver-white markings.

The adult of the Oriental fruit fly has a wasp like appearance. The wing of the fly has a dark band running along the front edge of the wing. The fly has two vertical yellow stripes on the thorax and there is a characteristic dark T-shaped marking on the abdomen. The Oriental fruit fly adult is bigger than the adults of Medfly and Natal fly, with a body length of about 8 mm.

Females of all three pest species have an ovipositor protruding from the tip of the abdomen. This is used to pierce the fruit skin and lay banana-shaped eggs in small pockets below the surface. Females frequently make trial punctures, the so-called “abortive stings”, before selecting a spot for oviposition. Hatched larvae are cream-coloured, legless and can reach a length of about 6 to 8 mm. The body tapers to a point at the mouthparts and is truncated at the posterior. The larvae burrow into the fruit tissue. Mature larvae leave the fruit and pupate in the soil from where the adults emerge in due course.

1.3 Infestation sites on the tree

Fruit fly pest species attack only the fruit stage. However, it is important to remember that throughout the year the canopy of evergreen citrus is favoured as a source of shelter and food by adults. The latter comprises sources such as droplets of water, honeydew and animal faeces (e.g. birds and lizards within orchards).

The larval developmental cycle is not always so readily completed in some citrus cultivars as in crops such subtropical and deciduous fruits. Citrus rind oils that can be released during the oviposition process that frequently kill the eggs. In addition many larvae are unable to burrow through the albedo to get at the underlying juice segments.

1.4 Damage

1.4.1 Symptoms

The skin around oviposition punctures and abortive stings usually becomes discoloured with time. When the fruit has a greenish hue, the punctured area will first become yellow before the decaying surface tissue turns brown. On well-coloured fruit, browning of the tissue is usually the first sign of damage. These colour changes become progressively more visible, but generally can be seen unaided about eight days after the skin has been punctured.

The puncture can be exploited by secondary insects such as vinegar flies and various small beetles. Immature stages of these insects must not be confused with fruit fly larvae. Although similar to fruit fly in appearance, the largest larvae of vinegar flies are about half the...
length of those of fruit fly, while beetle larvae have well-defined heads and legs.

Export regulations require that, if a single live fruit fly larva is found in a consignment of fruit during inspection, then the entire consignment must be rejected. Such rejection leads to delay and extra costs as a result of the need to resort and repack the fruit. The oviposition puncture also acts as an entry point for fungi which can cause post-harvest fruit decay. This hazard must be avoided.

1.4.2 Seasonal occurrence

Citrus is primarily subject to attack by fly populations that originate in hosts outside the orchard environs. There are two annual peaks of fly activity that citrus growers need to control and they are as follows:

1.4.2.1 Late summer/autumn

During this period, flies which have developed in a succession of summer hosts, migrate into citrus orchards where they can reach high density levels. These populations will commence attacking early maturing citrus cultivars as they break colour.

1.4.2.2 Early spring

The cold weather of winter will variably reduce populations present in the orchards and also other sites where adults shelter. However, the surviving flies pose a severe threat to late-hanging citrus cultivars in early spring. These fruit are fully coloured and ripe and this facilitates the development of larvae. The hazard of rejections of such fruit is increased and every effort should be made to maintain control quality during their harvest period.

1.4.3 Association between birds and fruit flies

High numbers of fruit-eating birds in orchards, particularly in easy-peeler orchards, can result in high fruit fly infestation. Birds inflict wounds on fruit which then provide good feeding and egg-laying sites for fruit flies. Moreover, bird faeces are natural sources of protein for fruit flies and can compete with artificial proteinaceous baits used for fruit fly control. Options to reduce incidence of birds in the orchards include the use of loud noises, reflected lights and exclusion nets. If birds are not controlled, routine fruit fly control measures might not be adequate and would have to be increased.

2 MANAGEMENT ASPECTS

2.1 Infestation

2.1.1 Non-bearing trees

Fruit flies are not a threat to non-bearing trees. However, non-bearing trees which surround unharvested trees can harbour fruit flies in search of shelter or food.

2.1.2 Bearing trees

2.1.2.1 Monitoring of adult fly populations

Adult fly activity can only be monitored with traps and lures. Full details of traps for monitoring flies are presented below.

It is essential that fly activity be monitored during the peak activity periods. Where aerial bait application forms a significant part of the control operation, it is also essential to monitor fly activity regularly. Because the production of fly-free crops for export is of critical importance it is recommended that, in general, growers make liberal use of traps to monitor control efficacy throughout the harvest season.

One of the pre-requisites for conformance to GLOBALGAP standards is the monitoring of insect pests. By only reacting to pest populations based on monitoring, the grower will be applying good agricultural practices in that he will not be applying pesticides unnecessarily. In the case of fruit flies, the number of individuals trapped could also indicate the type of treatment needed, e.g. aerial versus ground baiting.

There are four trap attractant combinations that can be used for fruit fly monitoring in citrus: (1) Sensus trap baited with Capilure, (2) Sensus trap baited with Questlure, (3) Chempac Bucket
trap baited with Biolure® Fruit Fly and (4) Bucket type traps baited with Methyl Eugenol (ME). Sensus trap baited with either Capilure or Questlure is used to monitor the population of Medfly and Natal fly. Biolure baited traps can be used to monitor populations of the three fruit fly pest species in orchards but there are no thresholds. The ME baited trap is used for monitoring of the Oriental fruit fly.

For trapping systems targeting Medfly and Natal fly, threshold levels exist only for Capilure baited and Questlure baited Sensus traps. It is therefore essential to include these two traps in the monitoring system for these two pest species.

Monitoring of the Oriental fruit fly is a requirement for phytosanitary registration of citrus for export to special markets (USA, Japan, South Korea, China and the European Union – EU). It is therefore essential that ME baited traps are used in all commercial citrus orchards, even in areas where the pest is considered absent.

All traps should preferably be examined at weekly intervals. It is highly recommended to make use of the fruit fly identification sheet for proper identification of the targeted fruit fly pests in citrus orchards.

2.1.2.1.1 Sensus trap

The Sensus trap is recommended for monitoring populations of Medfly and Natal fly. The trap consists of a blue lid and a transparent receptacle in which the dead flies collect (Figure 1). Two types of attractants can be used; Capilure and Questlure.

DO NOT USE TWO DIFFERENT LURES TOGETHER IN THE SAME TRAP

It is recommended that some polybutene adhesive or grease be placed on the piece of wire from which the Sensus trap is suspended to prevent ants from entering the trap and removing the flies.

![Figure 1. The Sensus fruit fly trap](image)

Use of Capilure in the Sensus trap

A Capilure capsule (red) is attached to the Sensus trap lid. A DDVP block is added to kill the flies as the flies are attracted to, but not killed, by Capilure. Capilure attracts male flies only.

Use of Questlure in Sensus trap

The Questlure capsule (green) is applied in the same way as the Capilure capsule. Again a DDVP block is added. Questlure attracts mostly female fruit flies.

Lay-out of traps in the orchard

For monitoring of Medfly and Natal fly, it is highly recommended that both Capilure- and Questlure-baited traps be used in citrus orchards and should be spaced at least 50 m apart. On large farms (>100 ha) where Capilure has proved reliable in the past, this lure alone can be used for monitoring purposes, but smaller farms are more subject to the movement of fruit flies from other non-treated crops and in these cases it is advisable to use Questlure as well. The trapping density varies with the size of the orchard as follows:

- For up to 6 ha of citrus, 1 Capilure and 1 Questlure trap should be used.
- For 7-9 ha citrus, 2 Capilure and 2 Questlure traps should be used.
- For 10-12 ha citrus, 3 Capilure and 3
Questlure traps should be used.

- On farms more than 12 ha but less than 100 ha, one trap of either Capilure or Questlure is required every 2 ha (total trap numbers should be 50% Capilure and 50% Questlure).
- On farms larger than 100 ha citrus, one trap of either Capilure or Questlure is required every 5 ha (total trap numbers should be 50% Capilure and 50% Questlure).

Traps at packhouses

A Questlure trap should be placed where fruit arrives before entering the packhouse. If numbers of flies caught per week exceed the threshold (provided in 2.1.2.2), extra care should be taken to keep fruit in trailers and bins covered at all times. If numbers of flies are consistently high, bait stations should be hung in shade trees near the packhouse.

Sensus baited traps should be hung just inside the foliage canopy on the northern side of trees in the outer two to four rows of orchards. Within the canopy the trap must be able to hang freely so that it does not become entangled with leaves or fruit.

Capilure, Questlure and DDVP must be replaced every 6-8 weeks.

2.1.2.1.2 Chempac Bucket trap and Biolure® Fruit fly

The Chempac Bucket trap is a McPhail type trap. The trap consists of a transparent lid and a yellow bucket in which flies collect (Figure 2). The yellow bucket contains three lateral holes close to the top and an inverted hole at the bottom of the trap for entrance of flies. Three plastic pipes are supplied with each trap and these must be fitted into the three lateral holes to prevent entering flies from flying out of the trap. The food-based attractant Biolure® Fruit Fly can be used with this trap.

Figure 2. Chempac Bucket trap

The Biolure® Fruit Fly is available as three sachets containing separately ammonium acetate, trimethylamine hydrochloride and 1,4-diaminobutane (Putrescine). The plastic seal of each sachet must be peeled off for release of attractant. The brown paper strip that covers a sticky area at the back of each Biolure® Fruit fly sachet must be removed and the three separate sachets must be stuck around the sides of the trap. A DDVP block must be placed at the bottom of the trap to kill fruit flies entering the trap. Traps should be hung on the shady side of the tree at a height of ±1.8 m. The density for traps baited with Biolure® Fruit Fly is 1 trap per 2 hectares.

Attractants and DDVP must be replaced every 6 weeks.

2.1.2.1.3 Bucket type traps and ME

Four bucket type traps: Morocco, Lynfield, Chempac Bucket and McPhail, are recommended for use with the attractant ME which is fairly specific to males of some Bactrocera species including the Oriental fruit fly.

The Morocco trap is a simple white bucket type of trap composed of a cylindrical plastic container with four equidistant holes on the upper third. A plastic basket is fitted in the lid in which the ME dispenser should be placed.
The Lynfield trap is a bucket type trap composed of a cylindrical plastic container with four equidistant holes on the upper third. The lid of the trap contains a hook to which an ME dispenser such as Invader Lure must be fitted.

The Chempac Bucket trap is a yellow cylindrical container with an opaque lid (as described in 2.1.2.1.2). A plastic basket can be fitted in the lid of the trap to contain an ME dispenser.

The McPhail trap consists of two parts, a clear lid and a yellow bottom section with an inverted funnel entrance underneath. The ME dispenser is suspended from a plastic basket at the top of the trap.

Various ME dispensers are commercially available in South Africa. ME is available as slow release dispensers in the form of a plug, a wafer or a fibre-board block (Invader Lure). ME should be used in bucket type traps such as Morocco trap, Lynfield trap, Chempac Bucket trap and McPhail trap. Only one ME dispenser must be placed per trap. Maximum precaution is required while handling ME in order to avoid contamination on the outside of the trap. When using ME with other fruit fly attractants (e.g. Questlure, Capilure, BioLure 3 component), preferably designate different persons to handle the different attractants in order to avoid cross contamination of traps.

An insecticide such as DDVP must also be placed in all bucket type traps to kill any attracted flies. One small piece of DDVP (1 cm x 1 cm) should be used per trap.

For monitoring of the Oriental fruit fly, ME baited traps should be spaced at least 400 m apart. The density of ME baited traps varies according to the status of the pest in the area:

- For areas where the pest is considered absent, 1 ME trap should be used per 100 ha.
- For areas where the pest is transient (under eradication), 3-5 ME traps should be used per 100 ha.
- For areas where the pest is considered present, 2-4 ME traps should be used per 100 ha.

Traps should be placed about 1.5 m above ground and should not be exposed to direct sunlight, strong wind and dust. Trap entrances should be cleared of leaves to allow access to flies and prevent entry of ants. The wire hanging the trap should be coated with a sticky ant barrier, grease or Vaseline for further protection against ants.

ME and DDVP should be replaced every 6-8 weeks depending on lure dispensers used.

### 2.1.2.2 Treatment thresholds

Different treatment thresholds exist for Medfly and Natal fly when the Capilure-baited Sensus trap is used. For Medfly, the threshold in a Capilure-baited trap is **four flies** per week. For Natal fly, the threshold in a Capilure-baited trap is **two flies** per week. When using Questlure in a Sensus trap, the threshold is **one female** fly per trap per week for both species.

Higher numbers of flies per trap per week than the above thresholds indicate that control is inadequate and intervention is required.

Whilst the treatment threshold for the Oriental fruit fly is still being determined, it is advisable that in an area where the pest is either transient or present, the numbers of male Oriental fruit flies in ME baited traps do not exceed **three** per trap per week.

## Maintaining fly populations below thresholds

Application of poisoned protein baits is required to control populations of all pest fruit fly species in citrus orchards.

Baiting in orchards starts during the period of maximum fruit fly activity in middle to late summer when fly numbers should be brought down to below the recommended level as soon as possible.

During the weeks preceding baiting, it is possible to catch several hundreds of flies per trap each week. Where baiting takes place from the ground, without any back-up from the air, two to four applications may be necessary to maintain fly numbers below the threshold. In the subtropical areas rain during the initial
application period may result in even more weekly applications being needed to achieve the desired effect. These factors should be taken into account when deciding when to start the baiting programme.

In areas where the Oriental fruit fly is either transient (under eradication) or present (under suppression), an additional control measure known as the Male Annihilation Technique (MAT) is required. Application of MAT should commence once males are captured in traps during the fruiting season.

During the harvest period of late season cultivars, fly catches in these orchards and nearby orchards which have already been harvested, should be maintained as close to zero as possible.

Growers who have problems in reducing fly numbers or maintaining the recommended low counts, should call for assistance from a consultant to help them check their control programme.

The objective of any fruit fly control programme is to prevent fly oviposition during the period that fruit are susceptible to attack. Fly populations in orchards should be reduced to minimal levels by the time that fruit are susceptible to attack.

2.2 Control options

2.2.1 Biological

Biological control is not practical for the control of fruit flies. There are natural enemies that attack certain of the immature stages and these, together with climatic factors, can cause variations in annual fly density. However, these variations do not reduce the annual threat posed by the pest fruit fly species to the citrus crop.

2.2.2 Cultural

During the harvest period, fallen fruit should be regularly removed from orchards. In addition, fruit left on the tree after harvest or damaged by birds should be removed from the orchard. This orchard sanitation serves a threefold purpose by removing fruit possibly infested with fruit fly and false codling moth while, at the same time, reducing the spore load on sound fruit which can arise from decaying fruit on the orchard floor. The latter issue is of vital importance in reducing post-harvest decay. See the section on FALSE CODLING MOTH in this chapter for procedures to conduct effective orchard sanitation.

2.2.3 Plant protection products

Cover sprays have been developed for fruit fly control in other fruit crops. However, they have not been regarded as feasible propositions for use on citrus with available materials for reasons of efficacy, cost, pest repercussions and residues. To date, the “Attract and Kill” approach relying on the use of bait sprays or bait stations or MAT has been the most appropriate method for controlling fruit flies in citrus orchards.

Bait sprays and bait stations comprise a mixture of an attractant (mostly protein based) and toxicant. Both sexes of each fly species are attracted by the protein-based bait, although the latter is generally more attractive to females.

The bait spray programmes can be applied with ground-based machinery or by aircraft. The programme specifications for each type of application differ and are provided below.

The objective of MAT is to achieve a high number of male kills in order to reduce the number of matings which will subsequently lead to population control through reduced production of fertile offsprings.

For the Oriental fruit fly, MAT is an essential component in the control of the pest. The males of the Oriental fruit fly are targeted using ME and killed by an insecticide incorporated with ME.

MAT can be applied by hand or spatula or applicator depending on products being used.
2.2.3.1 Ground-based baiting

Baiting machinery

Three different types of ground-based machinery are used to apply the bait mixtures:

- **Tractor-drawn applicator for dilute bait**: This either consists of a 500 litre tank with pump and specialised spray equipment on the three-point, or a small modified mistblower. Bait is applied simultaneously from both sides of the machine by way of a single spray nozzle mounted on each of the dual arms of an adjustable “Y”-shaped rig. **No whirler plates are used and no wind is used in the case of mistblowers.** Ideally the spray disks should contain more than one hole. As a result the bait mixture is applied in jets of liquid directed upwards into the top half of the tree as coarse droplets.

- **Tractor-drawn applicator for concentrated bait (Mantis or Ladybird)**: CRI and Quest Developments (now Green Trading) designed an applicator for concentrated bait which is available in two models. The Mantis is PTO driven and mounted on the tractor three-point and the Ladybird is self-propelled and mounted on a small trailer. Both designs use a blower to deposit large droplets of concentrated bait on the tree foliage.

- **Knapsack sprayer for dilute bait**: This usually consists of a 15-20 litre back-pack tank with accessory spray gun. The bait is manually applied either under tank pressure or with the aid of a spray gun operating like a bicycle pump. Either way care should be taken to ensure that sufficient bait is applied per tree. The spray nozzle should be adjusted to deliver bait in the form of coarse droplets.

**Bait application**

The required amount of bait per tree should be delivered in large droplets over the major part of the tree canopy. The recommended volumes of protein and toxicant are presented in the following tables. The quantity of bait per tree must be related to size. Young trees require 100 to 300 ml dilute bait per application. Mature trees similarly require 550 to 800 ml. The diligent use of traps to monitor fly activity in individual situations may permit variable reductions in the recommended bait quantities applied per tree. A 2X concentration (of protein only) is commonly-used at half the above volumes.

When using the Mantis or Ladybird mistblower, concentrated bait sprays should be applied whereby the amount of protein used is increased by 15 folds. However the insecticide concentration should remain unchanged. The volume of bait applied per tree should not be less than 45 ml.

**Baiting programme**

- **Late summer/autumn fly peak**: To control this fly peak, bait applications with ground-based machinery should commence towards February. The objective must be to ensure a major reduction in fly activity in orchards by the time that early harvested citrus starts to break colour. During this peak, bait should be applied once a week and, after rain, to all citrus orchards. It is also desirable to apply bait to windbreaks.

- **Late winter/early spring peak**: During the cold weather of winter, baiting of unharvested Valencias and immediately surrounding orchards should only be done when trap thresholds are exceeded.

**Dilute bait mixtures**

One of the following dilute bait spray options comprising a mixture of a protein attractant and toxicant can be used:
The bait mixture for use with the Mantis or Ladybird applicator is made as follows:

<table>
<thead>
<tr>
<th>Products to mix</th>
<th>Dosage/100 ℓ water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proteins:</td>
<td></td>
</tr>
<tr>
<td>Hym-Lure ready for use or Lok-Lure or Buminal</td>
<td>400ml</td>
</tr>
<tr>
<td>Plus toxicant:</td>
<td></td>
</tr>
<tr>
<td>Dipterex or Malathion EC or Malathion WP</td>
<td>50 g</td>
</tr>
<tr>
<td>Plus:</td>
<td></td>
</tr>
<tr>
<td>Dipterex or Malathion EC or Malathion WP</td>
<td>50 g</td>
</tr>
<tr>
<td>Ready to use protein and toxicant mixture:</td>
<td>Dosage/ha</td>
</tr>
<tr>
<td>GF 120</td>
<td>1 – 1.2 ℓ in 4-29 ℓ of water</td>
</tr>
</tbody>
</table>

NOTES

- The dilute bait mixtures must be applied as soon as possible after mixing. They must not be kept overnight and longer.
- Where a bulk quantity of bait is prepared to supply a squad of operators using knapsack sprayers, the mixture must be well stirred before each filling.
- GF120 does not dissolve easily and must be pre-mixed thoroughly in a bucket of water before being added to the tank. It can at times be phytotoxic to Nadorcott mandarins (see 2.3 below).
- Bait formulations should not be kept from one season to the next.

The protein baits exert most attraction on the day of application. As a result the larger the area that can be treated during the morning, the bigger the overall bait impact will be. When using manually operated knapsack sprayers for application purposes, best results will be obtained if workers operate as a team to treat specific areas quickly.

Concentrated bait mixture

2.2.3.2 Aerial baiting

To achieve the most uniform distribution of droplets the bait should be delivered from a height of about 10 m above the treetops. Wind speed should not exceed 12 knots (16 km/h) during application. Baiting should be restricted to orchards.

The swath width during aerial baiting should be determined for each type of bait, aircraft and atomizing equipment used. The no-spray area during an aerial bait application should preferably be no more than 20 m in width. This is based on the knowledge that protein baits most effectively attract flies up to a distance of 10 m.

Aerial baiting is most frequently used to augment ground-baiting programmes if difficulty is being experienced in reducing fly numbers. As a result, its use is usually based on trap data to support both the need for aerial treatment and its resulting efficacy.

For aerial application, mixtures of Hym-Lure or Lok-Lure with malathion are intended for use at the rate of one litre of bait mixture per hectare. These are undiluted mixtures of toxicant plus...
protein concentrate. GF 120 is also registered for aerial spraying. The possible range of aerial bait mixtures is as follows:

<table>
<thead>
<tr>
<th>Products to mix</th>
<th>Dosage/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hym-Lure or Lok-Lure</td>
<td>750 ml</td>
</tr>
<tr>
<td>Plus: Malathion UL</td>
<td>250 ml</td>
</tr>
<tr>
<td>GF 120</td>
<td>1 ℓ</td>
</tr>
<tr>
<td>Plus: Water</td>
<td>1-3 ℓ</td>
</tr>
</tbody>
</table>

2.2.3.3 Bait stations

This approach to fruit fly control avoids the non-target effects caused by bait sprays.

M3 bait station

The M3 bait station was developed by CRI and Quest Developments. It has been used since 1999 and has the advantage that no insecticides are applied to the tree canopy. The bait station comprises a rigid holder that can be clipped onto a branch and an absorbant material containing the bait and toxicant that is held in place by a plastic grid. Current recommendations are for 300 bait stations to be used per hectare in Valencias and grapefruit, 350/ha in navel oranges and 400/ha in easy-peeling cultivars. When using the M3 bait station for fruit fly control it is essential to hang the bait stations **four weeks before the fruit become susceptible to fruit fly**, in order to lower the numbers in time. When using the M3 for fruit fly control it is advisable to use the Capilure attractant for monitoring purposes as the attractiveness of Questlure will be reduced in the presence of the M3s. It is essential to hang the bait stations correctly so that the holder stays horizontal with the bait facing the ground in order to prevent the bait from leaching out.

2.2.3.4 Male Annihilation Technique (MAT)

**Last Call FF**

For Medfly and Natal fly, Last Call FF is available as a control product targeting males. Last call FF is produced by Insect Science SA and requires the application of droplets containing the attractant and insecticide to the tree. The product contains enriched ginger oil (EGO), a male attractant for a number of Ceratitis species including Medfly and Natal fly and a contact insecticide (permethrin) in a protective, slow-release, paste-like matrix. Small droplets are applied to a few leaves on each tree using a special applicator. The droplets are attractive to males of Medfly and Natal fly. When these flies come in contact with the droplet, they pick up enough of the insecticide to kill them. The dosage rate is 3000 droplets per hectare but care should be taken to avoid any contact with the fruit because permethrin residues are not permitted on citrus.

**ME-based MAT**

For the Oriental fruit fly, a number of methods of MAT such as wooden fibre blocks impregnated with ME and malathion (e.g. Invader-b-Lok, blocks impregnated with Chempac ME liquid and malathion) and SPLAT technology containing ME and spinosad such as STATIC Spinosad ME are registered for control of the pest in South Africa. The application rates and methods of MAT products registered for control of Oriental fruit fly are provided below:
2.3 Pre-harvest intervals for fruit fly control products

Some fruit fly control spray products may not be applicable throughout the season. The maximum residue level of Malathion/Mercaptothion in the European Union was changed to 2.0 mg/kg in September 2015 which then requires a 7-day pre-harvest interval. GF-120 may be used throughout the season as it has a 1 day pre-harvest interval. Ground-based spray applications of GF-120 on Nadorcott mandarin at the green and colour-break stages may be phytotoxic to the fruit. Ground-based spray applications of GF-120 are however safe on Nadorcott mandarin at the mature ripe stage. Trichlorfon residues on fruit may not be tolerated by some international retailers.