



# Cutting Edge

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## Fruit fly monitoring and control recommendations

by

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Recommendations for fruit fly monitoring and control were made in Cutting Edge numbers 26 and 27 in 2005. These were followed by changes to the pre-harvest interval for Malathion-based bait sprays (Cutting Edge 70), a change to the treatment threshold for Natal fly when using Capilure in Sensus traps (Cutting Edge 78) and the recommendation to use more than one mode of fruit fly control on early-maturing citrus such as Satsuma mandarins (Cutting Edge 83).

Moreover, the invasive fruit fly *Bactrocera invadens* has recently raised concerns for the South African citrus industry due to its spread in Southern Africa in 2008 (Cutting Edge 77). A surveillance trapping programme has been established in South Africa and it is important that this surveillance network include all citrus production areas (Cutting Edge 78). CRI is therefore calling on citrus growers and interested parties to participate in this network through eugenol and servicing of traps baited with methyl eugenol - a strong attractant for males of *B. invadens*.

The latest fruit fly monitoring and control recommendations including the above updates are reviewed in this issue.

### Monitoring of local fruit fly pests

It is essential that activity of local fruit fly pests be monitored during the peak activity period, which is from late summer to early spring. Where aerial bait application forms a significant part of the control operation, it is also essential to monitor fly activity regularly. The Sensus trap is recommended for monitoring populations of Medfly and Natal fly in citrus. Three types of attractants can be used; Capilure, Questlure and Ceratitislure. Different lures should not be used together in the same trap. Capilure attracts male flies only. Questlure attracts mostly female fruit flies. Ceratitislure attracts mostly male flies. It is highly recommended to have both Capilure and Questlure baited traps in a fruit fly monitoring programme since thresholds have been developed for these two lures and the lures are also specific to Medfly and Natal fly. The use of

Ceratitislure should be optional. 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. A DDVP (dichlorvos) block must be added to the trap to kill attracted flies. 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.

Where both Capilure- and Questlure-baited traps are used in an orchard they should be spaced at least 50 m apart. 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 (if both lures are used, total trap numbers should be 50% Capilure and 50% Questlure).

Fruit fly should also be monitored outside packhouses. One Questlure baited trap should be used.

Individual 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. Traps should be examined at weekly intervals and the fly catches recorded.

### Treatment thresholds for Medfly and Natal fly

Different treatment thresholds exist for Medfly and Natal fly when the Capilure-baited Sensus trap is used. In order to distinguish between fruit fly species, it is highly recommended to make use of a fruit fly identification sheet available from CRI. For Medfly, the threshold in a Capilure-baited trap is **four flies** per week. For Natal fly, the threshold in a



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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 additional intervention is required.

## **Surveillance trapping programme for *B. invadens***

A bucket type trap e.g., Chempac Bucket trap or the Moroccan trap is recommended for the surveillance. Methyl eugenol (ME) in the form of a dispenser should be used in the trap. A dichlorvos strip should be added to the trap to kill any attracted flies. Care should be taken while handling ME in order to prevent contamination on the outside of the trap. The ME trap should be suspended on host trees such as citrus and mango. The recommended trap density is 1 trap per km<sup>2</sup> or 1 trap per 100 ha. Trap details such as trap number, host tree where the trap is placed and GPS positions should be recorded and forwarded to CRI. Traps should be checked at least once a month and fresh ME and dichlorvos should be replaced every 6 weeks. All trap servicing records should be kept and forwarded to CRI. If no specimens are found in the trap, the date of servicing and zero capture must also be recorded as this is important to show that an area is free of the pest. If specimens are caught, they should be placed in plastic vials and sent to CRI for identification. Any suspected specimen must be reported immediately.

## **Control recommendations for local fruit fly pests**

Baiting in orchards should start in late summer (End of February/ Early March) when fly numbers are high and should be brought down to below the recommended level as soon as possible. Control measures must be continued while the orchard is being harvested until all fruits have been removed. Type and volume of bait products used for control should be recorded.

### Ground-based bait sprays

A tractor drawn applicator or knapsack sprayer can be used to deliver dilute bait mixtures. The Mantis or Ladybird applicator can be used to deliver concentrated bait sprays.

The registered dilute bait mixture volumes in 100 L of water consist of either 400 ml HymLure or 400 ml LokLure or 250 ml Buminal as an attractant plus

one of the following toxicants: 175 ml Malathion EC or 300 g Malathion WP or 50g Dipterex (trichlorfon). The required amount of bait per tree should be delivered in large droplets over the major part of the tree canopy. 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. When the Mantis or Ladybird applicator is used, **only** the protein component of bait mixtures should be increased, by 15 fold (i.e. 6 L HymLure or LokLure; 3.8 L Buminal). Under no circumstances must the toxicant concentration be increased. Concentrated bait sprays should be applied at a rate of 45 ml per tree.

GF-120 NF is also registered as a formulated bait mixture and should be applied at the rate of 1-1.2 L diluted in 19-29 L water, per hectare (reaching a total volume of bait mixture of 20-30 L per hectare). Due to the high density of GF-120 NF, it is very important to carefully follow the mixing instructions provided on the label of the product. If mixing procedure is not followed, GF-120 NF will sink to bottom of tank without mixing or dissolving. Pre-mixing of GF-120 NF with water in a separate bucket before addition to the tank could further facilitate mixing procedures. There is no change in dilution of GF-120 NF and in the volume delivered per tree when the Mantis or Ladybird applicator is used.

Bait mixtures must be applied as soon as possible after mixing. They must not be kept overnight and longer. Bait formulations should not be kept from one season to the next, as they have a very limited shelf-life. 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 impact of the bait will be.

### Aerial sprays

Mixtures of either 750 ml HymLure or 750 ml LokLure 1:1 plus 250 malathion UL are registered for aerial baiting at the rate of one litre per hectare. These are undiluted mixtures of toxicant plus protein concentrate. GF 120 NF is also registered for aerial spraying at the rate of 1 L in a spray mix with 1-3 litres of water.

### M3 bait station

The M3 bait station has the advantage that no insecticides are applied to the tree. Current recommendations are for 300 bait stations to be



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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 is freely suspended with the bait facing the ground in order to prevent the bait from leaching out.

### Last Call FF

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) 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 attractant in the droplet “calls” both male and female fruit flies to mate or feed on the droplet. 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.

### Pre-harvest intervals for fruit fly control products

**Some fruit fly control products may not be applicable throughout the season.** The maximum residue level of Malathion/mercaptotion was

reduced to 0.01 mg/kg in January 2009. For late season bait spray options, alternative products such as GF120 or trichlorfon should be used. However, some international retailers will not accept fruit from orchards sprayed with trichlorfon. Another alternative fruit fly control option during the late season would be the use of bait stations. The table below lists the pre-harvest interval period for all registered fruit fly products.

Product	Pre-harvest interval/days (Applicable to specific export markets)
Mercaptothion/Malathion/ in fruit fly bait sprays	28 (EU*), 14 (Canada), 7 (CODEX**, USA, Japan)
Trichlorfon/Dipterex	10 (EU etc) , 28 (CODEX**, USA)
GF-120 NF (Spinosad)	1
Last Call FF	0
M3	0

\* European Union

\*\* CODEX applies to China, Hong Kong, Middle East and Singapore.

### Cultural control

Weekly orchard sanitation must be carried since fallen fruits or fruits left on trees after harvest are important breeding sites for fruit flies. Trailers containing fruits outside of packhouses must be covered and rejected fruits must be removed daily. Removed fruits should be shredded or buried (30 cm deep).



## Monitering van vrugtevlieg en aanbevelings vir beheer

deur

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Aanbevelings vir die monitering en beheer van vrugtevlieë is in Snykant 26 en 27 in 2005 gepubliseer. Dit is opgevolg met die volgende: Snykant 70 - veranderinge aan die voor-oes interval vir Malathion-gebaseerde lokmiddel bespuitings; Snykant 78 - 'n wysiging aan die behandelingsdrempelwaarde vir Natalvlieg wanneer Capilure in Sensus lokvalle gebruik word en Snykant 83 - aanbevelings om meer as een metode van beheer vir vrugtevlieg in sitrus wat vroeg ryp word, soos Satsuma mandaryne, te gebruik.

Verder het die indringer vrugtevlieg, *Bactrocera invadens*, onlangs kommer vir die Suid Afrikaanse sitrusindustrie gewek a.g.v. die verspreiding daarvan in Suider Afrika gedurende 2008 (Snykant 77). 'n Waarskuwingsnetwerk-program is in Suid Afrika tot stand gebring en dit is belangrik dat hierdie netwerk alle sitrusproduserende areas insluit (Snykant 78). CRI doen dus 'n beroep op sitrusprodusente en belangstellende partye om deel te word van hierdie netwerk deur lokvalle te plaas en in stand te hou m.b.v. methyl eugenol – 'n sterk lokmiddel vir *B. invadens* mannetjies.

Die nuutste vrugtevlieg monitering en aanbevelings vir beheer, insluitende bogenoemde word in hierdie uitgawe hersien.

### Monitering van plaaslike vrugtevlieg plaë

Dit is belangrik dat die aktiwiteite van plaaslike vrugtevlieg plaë gedurende die spitsstye, wat van laat somer tot vroeë lente is, gemonitor moet word. Waar lugbespuitings 'n belangrike deel van beheer is, is dit ook belangrik om vlieg aktiwiteit gereeld te monitor. Die Sensus lokval word vir monitering van populasies van Medvlieg en Natalvlieg in sitrus aanbeveel. Drie soorte lokmiddels kan gebruik word: Capilure, Questlure en Ceratitislure. Verskillende lokmiddels moet nie saam in dieselfde lokval gebruik word nie. Capilure lok slegs mannetjies. Questlure lok meestal wyfies. Ceratitislure lok hoofsaaklik mannetjies. Dit word sterk aanbeveel om beide Capilure en Questlure lokvalle in 'n vrugtevlieg moniteringsprogram te hê omdat drempelwaardes vir hierdie twee lokmiddels ontwikkel is en omdat die lokmiddels ook spesifiek

vir Medvlieg en Natalvlieg is. Die gebruik van Ceratitislure moet opsioneel wees. Op groot plase (>100 ha) waar Capilure in die verlede bewys het om betroubaar te wees, kan hierdie lokmiddel alleen vir moniteringsdoeleindes gebruik word. Kleiner plase word egter meer aan die beweging van vrugtevlieë vanaf ander nie-behandelde gewasse blootgestel en in hierdie gevalle word dit aanbeveel om Questlure ook te gebruik. 'n DDVP (dichlorvos) blok moet by die lokval ingesluit word om vlieë wat gelok is, te dood. Dit word ook aanbeveel om 'n poli-buteen smeermiddel of ghries aan die stukkie draad waaraan die Sensus lokval hang te smeer om te verhoed dat miere in die lokval beland en die vlieë verwyder.

Waar beide Capilure en Questlure lokvalle in 'n boord gebruik word moet hul ten minste 50m uitmekaar gespaseer wees. Die digtheid van die lokvalle word deur die grootte van die boord bepaal:

- Vir tot en met 6 ha sitrus moet 1 Capilure en 1 Questlure lokval gebruik word.
- Vir 7-9 ha sitrus moet 2 Capilure en 2 Questlure lokvalle gebruik word.
- Vir 10-12 ha sitrus moet 3 Capilure en 3 Questlure lokvalle gebruik word.
- Op plase van meer as 12 ha maar minder as 100 ha word een lokval van of Capilure of Questlure vir elke 2 ha benodig (totale getalle van lokvalle moet 50% Capilure en 50% Questlure wees).
- Op plase groter as 100 ha sitrus word een lokval van of Capilure of Questlure vir elke 5 ha benodig (indien beide lokmiddels gebruik word moet totale getalle van lokvalle 50% Capilure en 50% Questlure wees).

Vrugtevlieg moet ook aan die buitekant van pakhuse gemonitor word. Een Questlure lokval moet gebruik word.

Individuele lokvalle moet binne die blaardak, aan die **noordelike** kant van die bome, in die buitenste twee tot vier rye van die boorde gehang word. Binne-in die blaardak moet die lokval vry hang sodat dit nie in die blare of vrugte verstremel kan raak nie.

Lokvalle moet met weeklikse intervalle ondersoek word en rekords moet van vliegvangste gehou word.



## Behandelingsdrempelwaardes vir die Medvlieg en Natalvlieg

Daar is verskillende behandelingsdrempelwaardes vir Medvlieg en Natalvlieg wanneer Capilure Sensus lokvalle gebruik word. Om dit moontlik te maak om tussen vrugtevliespesies te onderskei, word dit sterk aanbeveel om van 'n vrugtevlieg identifikasiekaart, beskikbaar vanaf CRI, gebruik te maak. Vir Medvlieg is die drempelwaarde in 'n Capilure lokval **vier vlieë** per week. Vir Natalvlieg is die drempelwaarde in 'n Capilure lokval **twee vlieë** per week. Wanneer Questlure in 'n Sensus lokval gebruik word, is die drempelwaarde **een wyfie** per lokval per week vir beide spesies.

Hoër getalle van vlieë as bogenoemde drempelwaardes per lokval per week dui daarop dat beheer onvoldoende is en dat addisionele ingryping nodig is.

## **Waarskuwingsnetwerk-program vir *B. invadens***

'n "Bucket" tipe val, bv. "Chempac Bucket" of "Moroccan" val word vir die opname aanbeveel. Methyl eugenol (ME) moet in die vorm van 'n vrysteller in die lokvalle gebruik word. 'n Dichlorvos strook moet ook in die lokval geplaas word om enige gelokte vlieë te dood. Om kontaminasie van die buitekant van die lokval te voorkom, moet daar baie versigtig met die ME gewerk word. ME lokvalle moet in gasheerplante soos mango en sitrus geplaas word. Die aanbevole hoeveelheid valle vir die opname is 1 val per km<sup>2</sup> of 1 val per 100 ha. Die besonderhede van die val, insluitend die nommer, gasheerplant waar val geplaas is en GPS-posisies moet aangeteken en gestuur word na CRI. Lokvalle moet ten minste een maal per maand nagegaan word en vars ME en dichlorvos moet elke 6 weke in die valle geplaas word. Alle diensrekords moet gehou en gestuur word na CRI. As geen spesimen in die lokval gevind is nie, moet die datum van diens en nul hoeveelheid vangs ook aangeteken word, aangesien hierdie inligting belangrik is om te wys dat die area vry van die plaag is. As spesimens wel gevang is, moet dit in 'n plastiek houertjie geplaas word en so gou moontlik na CRI gestuur word vir identifikasie. Enige verdagte spesimen moet dadelik gerapporteer word.

## **Aanbevelings vir beheer van plaaslike vrugtevlieg plaag**

Daar moet met die gebruik van lokmiddels in die boorde tydens laat somer (einde van Februarie/Vroeg Maart), wanneer getalle van vlieë hoog is,

begin word en dit moet so gou moontlik tot onder die aanbevelingsvlak afgebring word. Daar moet met beheermaatreëls voortgegaan word terwyl daar in boorde geoes word totdat alle vrugte verwyder is. Rekords moet van die tipe en volume van lokmiddels wat vir beheer gebruik is, gehou word.

## Grondbespuitings

'n Spuitpomp wat deur 'n trekker getrek word of 'n knapsak-spuitpomp kan gebruik word om die verdunde lokmiddelmengsels toe te dien. Die Mantis of Ladybird spuitpomp kan gebruik word om die gekonsentreerde lokmiddelbespuitings te doen.

Die volumes van die geregistreerde verdunde lokmiddelmengsel in 100 L water kan uit 400 ml HymLure of 400 ml LokLure of 250 ml Buminal as 'n lokmiddel bestaan plus een van die volgende gifstowwe: 175 ml Malathion EC of 300 g Malathion WP of 50g Dipterex (trichlorfon). Die verlangde hoeveelheid lokmiddel per boom moet in groot druppels oor die grootste gedeelte van die blaardak toegedien word. Die hoeveelheid lokmiddel per boom moet met die grootte verband hou. Jong bome benodig 100 tot 300 ml verdunde lokmiddel per toediening. Volwasse bome benodig 550 tot 800 ml. Wanneer die Mantis of Ladybird spuitpomp gebruik word, moet **slegs** die proteïenkomponent van die lokmiddelmengsels 15 keer verhoog word (bv. 6L HymLure of LokLure; 3.8 L Buminal). Onder geen omstandighede mag die konsentrasie van die gifstof verhoog word nie. Gekonsentreerde lokmiddelbespuitings moet teen 'n tempo van 45 ml per boom toegedien word.

GF-120 NF is ook as 'n geformuleerde lokmiddelmengsel geregistreer en moet teen 'n konsentrasie van 1-1.2 L in 19-29 L water verdun, per hektaar toegedien word (wat 'n totale volume van lokmiddelmengsel van 20-30 L per hektaar sal wees). Weens die hoë digtheid van GF-120 NF is dit baie belangrik om die meng-instruksies op die etiket van die produk noukeurig te volg. As die prosedures nie gevolg word nie, sal GF-120 NF tot op die bodem van die tenk sink sonder om te meng of om op te los. Vooraf vermenging van GF-120 NF met water in 'n afsonderlike emmer voordat dit by die tenk gevoeg word kan die mengproses vergemaklik. Daar is geen wysiging aan die verdunning van GF-120 NF en ook nie in die volume wat per boom toegedien word wanneer die Mantis of Ladybird spuitpomp gebruik word nie.



# Snykant

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Lokmiddelmengsels moet so gou as moontlik nadat dit gemeng is, toegedien word. Dit moenie oornag of langer gehou word nie. Lokmiddelmengsels moet nie van een seisoen na 'n volgende gehou word nie weens hul baie beperkte rakleeftyd. Die proteïenlokmiddels se lokkrag is die sterkste op die dag van toediening en daarom hoe groter die area wat **gedurende die oggend** behandel kan word, hoe groter sal die algehele impak van die lokmiddel wees.

## Lugbespuitings

Mengsels van of 750 ml HymLure of 750 ml LokLure 1:1 plus 250 malathion UL is as lokmiddels vir lugbespuitings teen die konsentrasie van een liter per hektaar geregistreer. Hierdie is onverdunde mengsels van gifstof plus proteïenkonsentraat. GF 120 NF is ook as 'n lugbespuiting teen die konsentrasie van 1 l in 'n spuitmengsel met 1-3 liter water geregistreer.

## M3 lokvalstasie

Die M3 lokvalstasie het die voordeel dat geen gifstowwe aan die boom toegedien word nie. Die aanbevelings tans is om 300 lokvalstasies per hektaar in Valencias en pomelos te gebruik, 350/ha in nawel lemoene en 400/ha in sagte sitrus kultivars. Wanneer die M3 lokvalstasie vir vrugtevlieg beheer gebruik word is dit noodsaaklik dat die lokvalstasies **vier weke voor die vrugte vatbaar is vir vrugtevlieg** gehang word om sodoende die getalle betyds te verminder. Wanneer die M3 vir vrugtevlieg beheer gebruik word is dit raadsaam om Capilure vir moniteringsdoeleindes te gebruik omdat die lokkrag van Questlure in die teenwoordigheid van die M3s sal verminder. Dit is noodsaaklik om die lokvalstasies korrek te hang sodat die houer vry kan hang en die lokmiddel na die grond gerig is om te voorkom dat die lokmiddel uitwas.

## Last Call FF

Last Call FF word deur Insect Science SA vervaardig en vereis dat druppels, wat die lokmiddel en die insekdoder bevat, aan die boom toegedien word. Die produk bevat verrykte gemmer-olie (EGO) en 'n kontak-insekdoder (permethrin) in 'n beskermende, stadig-vrystellende, pasta-agtige matriks. Klein druppeltjies word op 'n paar blare van elke boom toegedien deur 'n spesiale toediener te gebruik. Die lokmiddel in die druppel "roep" beide mannetjies en wyfies om op die druppel te paar of

te voed. Wanneer die vlieë met die druppel in kontak kom kry hul genoeg van die insekdoder in om hul te dood. Die konsentrasie van die dosis is 3000 druppels per hektaar maar voorsorg moet getref word om enige kontak met die vrugte te vermy omdat residue van permethrin nie op sitrus toelaatbaar is nie.

## Voor-oes intervale vir produkte vir beheer van vrugtevlieg

**Sommige van die produkte vir beheer van vrugtevlieg mag nie regdeur die seisoen aangewend word nie.** Die maksimum residuvlak van Malathion/mercaptotion is na 0.01 mg/kg in Januarie 2009 verminder. Vir bespuitingsopsies laat in die seisoen moet alternatiewe produkte soos GF120 of trichlorfon gebruik word. Party internasionale handelaars sal egter nie vrugte aanvaar wat van boorde afkomstig is wat met trichlorfon bespuit is nie. 'n Ander alternatiewe opsie vir die beheer van vrugtevlieg laat in die seisoen is die gebruik van lokvalstasies. Die tabel hieronder lys die voor-oes interval periode van al die produkte wat vir vrugtevlieg geregistreer is.

Produk	Voor-oes intervale/dae (Van toepassing op spesifieke uitvoermarkte)
Mercaptothion/Malathion/ in vrugtevlieg lokmiddelbespuitings	28 (EU*), 14 (Kanada), 7 (CODEX**, VSA, Japan)
Trichlorfon/Dipterex	10 (EU ens) , 28 (CODEX**, VSA)
GF-120 NF (Spinosad)	1
Last Call FF	0
M3	0

\* Europese Unie

\*\* CODEX is van toepassing op China, Hong Kong, Midde-Ooste en Singapoer.

## Bewerkingspraktyke vir beheer

Weeklikse boordsanitasie moet uitgevoer word omdat vrugte wat afgeval het of vrugte wat na oes aan bome gelos word belangrike broeiplekke vir vrugtevlieë is. Waentjies met vrugte buite die pakhuis moet bedek word en afgekeurde vrugte moet daagliks verwyder word. Verwyderde vrugte moet opgekap of begrawe word (30 cm diep).