Naturalure™
FRUIT FLY BAIT CONCENTRATE
TECHNICAL MANUAL

NO WITHHOLDING PERIODS
NO IMPACT ON EXPORT CROPS
AND WITH ORGANIC CERTIFICATION

Solutions for the Growing World
BACKGROUND

Tephritid fruit flies are some of the world’s most destructive insect pests and include Queensland fruit fly (Bactrocera tryoni), Mediterranean fruit fly (Medfly, Ceratitis capitata), the olive fruit fly (Bactrocera [Dacus] oleae) and the lesser Queensland fruit fly (B. neohumeralis).

Many methods have been used to control – and even eradicate – fruit flies. Initially cover sprays of broad-spectrum insecticides were used and these are still the main method of control in many areas. A targeted approach using olfactory attractants and bait sprays has also long been used in the detection, monitoring, and control of fruit flies.

COMPOSITION AND ORIGIN

NATURALURE™ Fruit Fly Bait Concentrate (FFBC) is a pre-packaged bait with a low application rate, reduced risk toxicant that provides improved consistency, attractiveness, and overall efficacy when compared to earlier bait-toxicant mixes. NATURALURE is marketed as GF-120™ NATURALYTE™ Fruit Fly Bait in the USA and as SUCCESS™ 0.02 CB in most Central American countries.

NATURALURE was jointly developed by the USDA-ARS Fruit Quality and Fruit Insects Research Unit and Dow AgroSciences in the USA. The optimised fruit fly bait uses commercially available ingredients, stabilisers (to improve shelf-life) plus humectants and adjuvants to improve longevity and attractiveness of the bait once it is applied.

Plant proteins and sugars that are highly attractive to tephritid species comprise the bulk of the fruit fly bait. The toxicant in NATURALURE is spinosad, a fermentation by-product of a naturally occurring soil bacterium, Saccharopolyspora spinosa. Spinosad has an extremely favourable mammalian and environmental toxicity profile. The combination of low use rates and low toxicity result in large margins of safety for NATURALURE.

Organic certification in Australia

NATURALURE has been certified by BFA as an allowed input, number 2005Al.

NATURALURE is also certified for use in organic production by OMRI in the United States.

In what way is NATURALURE different to earlier baits?

- All ingredients are optimised for attraction of multiple tephritid fruit fly species
- NATURALURE is active for at least 10 days after application
- NATURALURE can be stored for up to 2 years without degradation
- Industrial quality controls ensure consistent performance
- NATURALURE has organic certification in Australia and overseas
- NATURALURE has an extremely favourable mammalian and environmental toxicity profile
TARGET SPECIES

NATURALURE is registered for control of all fruit fly species in Australia, including:

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Queensland fruit fly</td>
<td><em>Bactrocera tryoni</em></td>
</tr>
<tr>
<td>Mediterranean fruit fly (Medfly)</td>
<td><em>Ceratitis capitata</em></td>
</tr>
<tr>
<td>Banana fruit fly</td>
<td><em>Bactrocera musae</em></td>
</tr>
<tr>
<td>Cucumber fly</td>
<td><em>Bactrocera cucumis</em></td>
</tr>
<tr>
<td>Lesser Queensland fruit fly</td>
<td><em>Bactrocera neohumeralis</em></td>
</tr>
<tr>
<td>Olive fruit fly</td>
<td><em>Bactrocera (Dacus) oleae</em></td>
</tr>
</tbody>
</table>

NATURALURE is registered elsewhere in the world for control of certain fruit flies which are a bio-security risk to Australia. These include melon fly (*Bactrocera cucurbitae*), oriental fruit fly (*Bactrocera dorsalis*) and papaya fruit fly (*Bactrocera papayae*).

TARGET CROPS

NATURALURE applications use only 0.24 grams per hectare of spinosad. The majority of NATURALURE applications will target crops susceptible to fruit fly injury such as citrus and mangoes. However, it is often desirable to treat urban areas and non-crop vegetation during fruit fly outbreaks.

Check with your local Dow AgroSciences representative and state government specialists to determine what is legal in your respective state or territory.
INTERSTATE CERTIFICATION ASSURANCE PROTOCOLS

NATURALURE is approved for use in several Interstate Certification Assurance (ICA) protocols. ICAs facilitate the movement of fruit between Queensland and southern states which enjoy freedom from fruit flies. More information should be sought from relevant industry groups and departments of agriculture.

STABILITY IN THE ENVIRONMENT

Spinosad, the active ingredient in NATURALURE, breaks down under ultra-violet light to carbon dioxide and water and does not persist in the environment. While the bait droplets remain active on the foliage or on fruit fly resting sites however, it is protected against breakdown.

HIGH FRUIT FLY PRESSURE SITUATIONS

When fruit flies are present in high numbers, particularly susceptible fruit crops such as stone fruit will require the application of cover sprays, as well as baiting and male annihilation technique (MAT) for successful fruit fly control.

AREA-WIDE MANAGEMENT PROGRAMMES

NATURALURE can be used in area-wide fruit fly management programmes, in which the bait is applied in orchards and on surrounding vegetation. It may also be used in baiting programmes in urban areas. Whilst NATURALURE will control both male and female fruit flies, for best results it should be applied in conjunction with MAT either using appropriate traps or other MAT devices.

CROP SELECTIVITY

Fruit fly baits can cause phytotoxic reactions in some crops and on some fruit. It is for this reason, application should be targeted at foliage and avoid contact with fruit.

NATURALURE can also be applied to the tree structure (truck and main branches) and to non-crop targets (e.g. wooden squares) but best results are achieved where these are placed at tree height rather than on grass under trees or in the inter-row.

RAINFASTNESS

NATURALURE when applied at a 1:1.5 dilution has good resistance to wash off. When applied at a 1:6.5 dilution it is as susceptible to wash-off as conventional fruit fly baits.

NATURALURE must be re-applied if rain washes bait off the foliage.
TIMING AND DURATION OF A BAITING PROGRAMME

The start and finish points of a baiting programme will be determined by several variables which include ambient daily temperatures, the level of background fruit fly activity, attractiveness of the crop to fruit flies and the stage of crop growth.

Fruit flies are active in warm conditions and are virtually inactive in cold temperatures. There is no need to bait when temperatures are so low that fruit flies are essentially dormant.

Fruit fly pressure in commercial orchards and farms may range from low to very high, and this will depend on the local area’s history of fruit fly control, the surrounding native vegetation “host sites”, the presence of abandoned orchards and backyard fruit trees nearby.

Crops vary inherently in their attractiveness to fruit flies – some crops are almost never attacked (e.g. avocados) while others like stonefruit and tomatoes are very attractive.

Possibly the most important factor is the stage of the crop. When there is no fruit or vegetable crop, fruit flies will not be an issue but as soon as the crop starts ripening, females are attracted by the smell given off by the ripening produce. In some stonefruit, this is almost straight after fruit initiation while in citrus it is much later in the crop.

Taking these factors into account, baiting should be started before the crop starts to attract females and be continued right through to harvest. Ideally, baiting would continue after harvest so that any flies emerging from windfall fruit or mummies on trees and vines would also be controlled and reduce the over-wintering population.

For produce which is subject to an ICA protocol, the parameters for baiting will be clearly spelled out and must be followed.

The appropriate number of spots to apply per hectare will vary with the dilution rate and the volume of the spot applied.

<table>
<thead>
<tr>
<th>Spot Volume</th>
<th>1:1.5</th>
<th>1:6.5</th>
<th>1:14</th>
<th>1:29</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5 L/ha</td>
<td>250</td>
<td>750</td>
<td>1500</td>
<td>3000</td>
</tr>
<tr>
<td>7.5 L/ha</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 L/ha</td>
<td></td>
<td>500</td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>30 L/ha</td>
<td></td>
<td>1000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40 mL</td>
<td>63</td>
<td>190</td>
<td>375</td>
<td>750</td>
</tr>
<tr>
<td>50 mL</td>
<td>50</td>
<td>150</td>
<td>300</td>
<td>600</td>
</tr>
<tr>
<td>60 mL</td>
<td>42</td>
<td>125</td>
<td>250</td>
<td>500</td>
</tr>
<tr>
<td>70 mL</td>
<td>35</td>
<td>107</td>
<td>215</td>
<td>428</td>
</tr>
<tr>
<td>80 mL</td>
<td>32</td>
<td>94</td>
<td>187</td>
<td>375</td>
</tr>
</tbody>
</table>

**GREEN** Desired number of spots for this dilution and spot size

**ORANGE** Within range of the correct number of spots for dilution and spot size

**WHITE** Out of scope – too many or too few spots for dilution rate or spot size

Naturalure should be applied in a band or as spots to foliage of crops or nearby vegetation. In orchards and vineyards, the application should be made to the foliage at about head height.
BAIT PREPARATION

NATURALURE is a viscous liquid which must be mixed with water. This is best achieved using a medium-high duty electric drill with a steel commercial paint stirring attachment. A 20 L galvanised drum is ideal as a mixing vat and plastic drums should be avoided to prevent fine shreds of plastic from the inside of the drum being mixed with the solution. Where 100 L or more of spray is to be mixed, a heavier duty mixer will be required. Ideally there should be provisions to mix the bait and water in the actual spray tank. This can be facilitated by providing an in-tank mixing unit, run off the tractor PTO (Power Take Off) or the quad bike battery. The tank is filled with water, the NATURALURE added and the tank is then agitated for 10-20 minutes to thoroughly mix. Complete mixing and an even consistency may not be achieved with manual stirring.

BAIT APPLICATION

Naturalure should be applied in a band or as spots to foliage of crops or nearby vegetation. In orchards and vineyards, the application should be made to the foliage at about head height. The diluted bait should be applied as very coarse droplets (4-6 mm diameter) as a spot application or as a band (refer to label for more information). Coarse droplets will remain attractive to fruit flies longer and resist rain wash off more than fine droplets or a cover spray. Even after drying down, coarse droplets will regain moisture when humidity rises (e.g., overnight). The following equipment has been found to be the most effective for treating orchards with NATURALURE.

Bait application equipment for small orchards (up to 5 ha) – Band or strip application

NATURALURE should be applied in a total spray volume of 7.5 L/ha so that 1-2 ha can be effectively sprayed with a backpack of about 12 L capacity. Conventional knapsacks are unsuitable for spraying Naturalure because the pumping mechanism and spray delivery system quickly become clogged.

An example of an efficient small sprayer is a backpack manufactured by Sidewinder Tree Injectors (see photo below). The equipment is a banana backpack spear injector¹ with the spear replaced by an adjustable spraying nozzle. The design features a lightweight fibreglass shell together with a hand driven pump and a 5-10 L spray bottle. A single pump of the spray handle comfortably delivers 15-20 mL of the diluted NATURALURE over a distance of 2-3 m.

¹ It is used in the banana industry for diesel injection of suckers or for bell injecting and bunch spraying.
Bait application equipment for larger orchards – Band or strip application

Growers can readily adapt existing bait sprayers, either tractor drawn or the smaller units mounted on agricultural quad bikes, to deliver NATURALURE. Alterations may be necessary to replace or remove filters that are too fine for NATURALURE and to ensure that spray nozzle apertures also are not too fine. Nozzles can be adjusted to vary the coarseness and width of the spray jet.

One possible option is a Silvan Selecta Rakpak unit fitted to a quad bike. The tank holds 50 L (tank capacities range from 14-200 L). A 12 volt Shurflo pump (fin cooled) with twin spray nozzles (nozzle aperture and nozzle direction adjustable) will deliver a steady jet of bait 3-4 m either side of the bike. The volume rate of spray per ha can be varied by the nozzle aperture, the speed of the bike, the number of rows sprayed and by use of a trigger, permitting spray to be applied in bursts rather than continuously. The pump works at 300 kPa (45 psi) delivering 13.6 L/min.

Smaller Shurflo pumps (e.g. 8000 series) with a capacity of 5.3 L/min or the 2088 series (now replaced by the 3901 series) with a capacity of 11.3 L/min are also sufficient for the job.

To apply 7.5 L of bait per ha, the bike is driven between rows 1 and 2 and then back between rows 3 and 4 at 20 kph.

Apply NATURALURE as a band spray to the orchard foliage or as spot sprays to trees and/or foliage. It may also be applied to non-crop targets (e.g. wooden squares) but best results are achieved where these are placed at tree height rather than on grass under trees or in the inter-row.

Cleaning of application equipment

As organic approval precludes the addition of biocides to NATURALURE, naturally-occurring yeasts and other micro-organisms may build up in application equipment. IMPORTANT: It is recommended that applicators only mix up that volume required for application on a daily basis. Application equipment must be cleaned after each day’s use.

Bait application equipment – Spot application

Spot application of NATURALURE can be made using equipment as simple as that used for drenching cattle or back line treatment of sheep. Alternatively gas-powered herbicide application equipment (forestry gas gun) can be modified to deliver a measured dose as coarse droplets.
**APPROVED LABEL**

NATURALURE is approved for use in all states of Australia by the APVMA.

<table>
<thead>
<tr>
<th>Situation</th>
<th>Pest</th>
<th>Use</th>
<th>Critical Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tree, fruit, nut, vine and vegetable crops and ornamentals</td>
<td>Fruit flies, including: Queensland fruit fly and Mediterranean fruit fly</td>
<td>1 L/ha</td>
<td>Mix 1 part of NATURALURE Fruit Fly Bait Concentrate with 6.5 parts of water. Spray solution can be applied as a band or spot spray (see Application section)</td>
</tr>
<tr>
<td>Non-crop vegetation and other fruit fly resting sites (for use in area-wide fruit fly eradication or control programmes)</td>
<td></td>
<td></td>
<td>Dilute as above or use as a concentrate spray by mixing 1 part of NATURALURE Fruit Fly Bait Concentrate with 1.5 parts of water and apply as a spot spray (see Application section).</td>
</tr>
</tbody>
</table>

AVOID spraying the fruit as phytotoxicity may occur. Mangoes and pears are particularly susceptible. The risk of phytotoxicity is increased during hot, dry conditions and re-application of spray to the same location on the plants. If using a weekly spray programme, alternate tree or crop rows to which the product is applied. Re-apply if rain washes bait off the foliage.

Read the complete product label before use.

**Withholding and Re-entry Period**

There is no harvest withholding period when NATURALURE is used as directed and there are no restrictions on workers entering the treated area.

**Compatibility**

NATURALURE should not be mixed with any other product. No wetters, spreaders or stickers should be added.

**Application**

**Band sprays (concentrated or dilute solution):**
Apply as a coarse spray in a 1 m wide band to the skirt of trees. Apply to one side of every row or every second row of trees.

**Spot sprays of the concentrated solution:**
Apply to trees and foliage as coarse spots of 20 mL per spot of 1 m². Apply 125 spots per hectare.

**Spot sprays of the dilute solution:**
Apply to trees and foliage as coarse spots of 50 mL per spot of 1 m². Apply 150 spots per hectare. Spots should be distributed evenly throughout an orchard to optimise effectiveness. Adjust the application of the spots to suit the number of trees per hectare, but do not exceed the application rate above.

If using a weekly spray programme, alternate tree or crop rows to which the product is applied.

**Confidence in a drum**

For more information contact your local Dow AgroSciences representative on TOLL FREE 1800 700 096 www.dowagro.com/au/