



# ***Naturally Better***

## ***Bt Insecticides***



# B.t.s - the Biological Solution

B.t. (*Bacillus thuringiensis*) is a naturally occurring bacterium found in most environments throughout the world. It is harmless to humans, animals, birds and fish, but lethal to hundreds of pest and disease carrying insects.

Individual strains of B.t., which are pathogenic to specific pests, have been carefully selected by Valent Biosciences Corporation for use as crop protection agents. Valent Biosciences Corporation are the world's largest B.t. producer, using their massive fermentation facilities to reproduce the B.t. organisms, then carefully formulating and packaging them.

Natural B.t.s from Valent Biosciences Corporation and Nufarm are ideal for use in conventional agriculture as well as in organic production systems, and integrated pest management programmes.

B.t.s have no harmful effects on beneficial insects such as predatory mites, ladybirds or honey bees.

Another important feature is that they have a zero withholding period – ripe fruit can be picked and eaten the same day that it is sprayed.

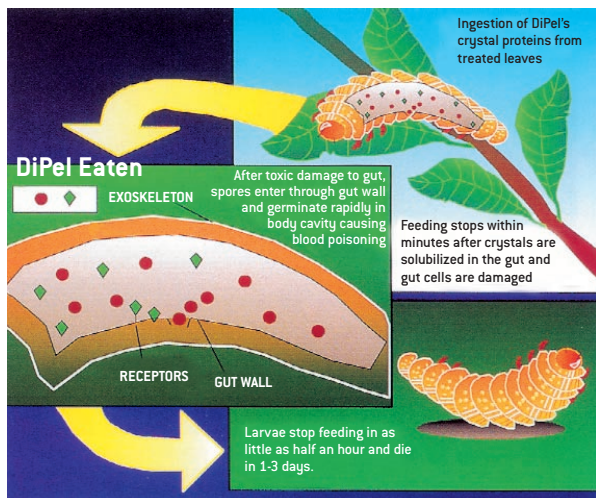
## How do B.t.s work?

B.t. products marketed in NZ by Nufarm, contain spores and toxic crystals which must be eaten by the insect to be effective.

Susceptible insects have the right alkaline gut environment to activate the crystals. As the crystals break down they free toxins which attack the lining of the gut. This enables spores to leak from the gut into the body cavity where they grow. The insect stops feeding within a few minutes, and dies in 1-3 days from septicaemia.

If insufficient B.t. is eaten to give an outright kill the larvae are weakened and are more likely to die from adverse weather conditions, starvation or other insect pathogens.

They may also fail to develop into an adult, or may develop but fail to reproduce. Thus the B.t. gives both a direct kill and an effect on the resulting population level.







## XenTari® WG

XenTari WG contains a superior naturally occurring strain of *Bacillus thuringiensis aizawai* patented as strain

1857. This B.t.a. is particularly effective against diamondback moth and white butterfly larvae on brassica crops.

The IPM brassica programme has been developed in response to high levels of resistance by diamondback moth to synthetic pyrethroids. If S.P.s are used at all, their use should be restricted to the second part of the season.



The programme separates B.t.k. and B.t.a. into different windows of application to ensure that diamondback moth populations are only subjected to the different toxins produced by each B.t., at different times of the year.

### USING B.T. ON BRASSICAS – AN INTEGRATED PEST MANAGEMENT PROGRAMME

Early window <small>September – Late January</small>	Late window <small>February – August</small>
DiPel® DF (B.t.k.)	XenTari® WG (B.t.a.)
Success™	Synthetic pyrethroids eg Sumi-Alpha®
Organophosphates eg Orthene®, Dew™ 500, Thiodan® 35EC	

The crop should be monitored by trained scouts and spraying should only be carried out when pest thresholds are exceeded. Within a window it is suggested that growers use B.t.s for the first few sprays after seeding or transplanting, and then change to one of the synthetic chemical options for later spray treatments.

This rotational strategy should minimise the possibility of resistance developing to the B.t.s, and maximise the useful life of the other insecticide groups.

**XenTari**

Naturally Better  
Against Caterpillars  
in Vegetables



## DiPel® DF

This high potency dry flowable formulation contains 32,000 International Units *Bacillus thuringiensis* *kurstaki* (H-3a, 3b, HD1)/mg.

It is effective against a wide range of caterpillars on many crops, including white butterfly and diamondback moth on brassicas, fruitworm and looper caterpillars on tomatoes, and leafrollers on kiwifruit, grapes, citrus, berryfruit and avocados.

### DiPel DF

Naturally Better  
Against Pests in  
Many Crops



## DiPel® ES

A unique oil-based suspension concentrate formulation of *Bacillus thuringiensis* *kurstaki* with proven efficacy against leafrollers on kiwifruit.

Both DiPel products are widely used in the conventional KiwiGreen spray programme, often giving better control of leafrollers than products based on the organophosphates such as diazinon.

DiPel ES is the favoured product for leafroller in the organic kiwifruit spray programme.

### DiPel ES

Naturally Better  
Against Leafroller  
in Kiwifruit



# HOW TO USE DIPEL ON KIWIFRUIT

*Organic kiwifruit production*

<b>Sept / Oct</b>	Apply an oil spray (1%) only if scale insects were a problem at previous harvest.
<b>Full Bloom</b>	DiPel DF 50g / 100L or DiPel ES 75ml / 100 L
<b>Petal Fall</b>	DiPel DF 50g / 100L or DiPel ES 75ml / 100L + Oil (1%)
<b>+ 10 – 14 Days</b>	DiPel DF 50g / 100L or DiPel ES 75ml / 100L
<b>+ 10 – 14 Days</b>	DiPel DF 50g / 100L or DiPel ES 75ml / 100L
<b>From Early January to Harvest</b>	Monitor leafrollers every 3-4 weeks. Check fruit for half an hour in each block. If any live caterpillars are found, spray DiPel within 7 days.
<b>From 1 February to Harvest</b>	Monitor scale every 3-4 weeks with leaf samples. Apply oil (1%) if needed.

## B.t. Use In Other Crops

Because it is harmless to bees, DiPel DF is the ideal insecticide to use on crops during flowering. For crops such as avocados and citrus, where this season's fruit is present at the same time as next season's flowers, DiPel DF is the only 'bee safe' option.

In vineyards caterpillar chewing of grapes becomes a site of entry for botrytis rot. DiPel DF is ideal for close-to-harvest use because it leaves no residue in wine, does not adversely affect fermentation, and is universally accepted by all of our wine markets.



Because of the size of avocado trees, many avocado orchards are sprayed by helicopter. This often creates concern from neighbours who are worried by possible spray drift. The proven safety record of B.t. products such as DiPel is more likely to make the aerial spraying more acceptable to the community.

Strawberries and tomatoes are crops which require numerous picks over a long period. DiPel DF with its zero withholding period, can be used to control caterpillars between each pick. DiPel poses no threat to either the workers who pick the fruit or to the consumers who eat it.





## VectoBac 12AS

Naturally Better  
Against Mosquitoes  
in Hawkes Bay



## VectoBac® 12AS

VectoBac 12AS contains *Bacillus thuringiensis israelensis*, discovered killing mosquitoes in a stagnant pond in Israel in 1978. Since then B.t.i. has been used worldwide to control mosquitoes and blackflies, vectors of some of the world's worst diseases.

VectoBac 12AS is a major weapon in the Ministry of Health's fight to control the Southern Saltmarsh mosquito in the Hawkes Bay region. This unwanted immigrant from Australia can carry the incurable Ross River virus disease.

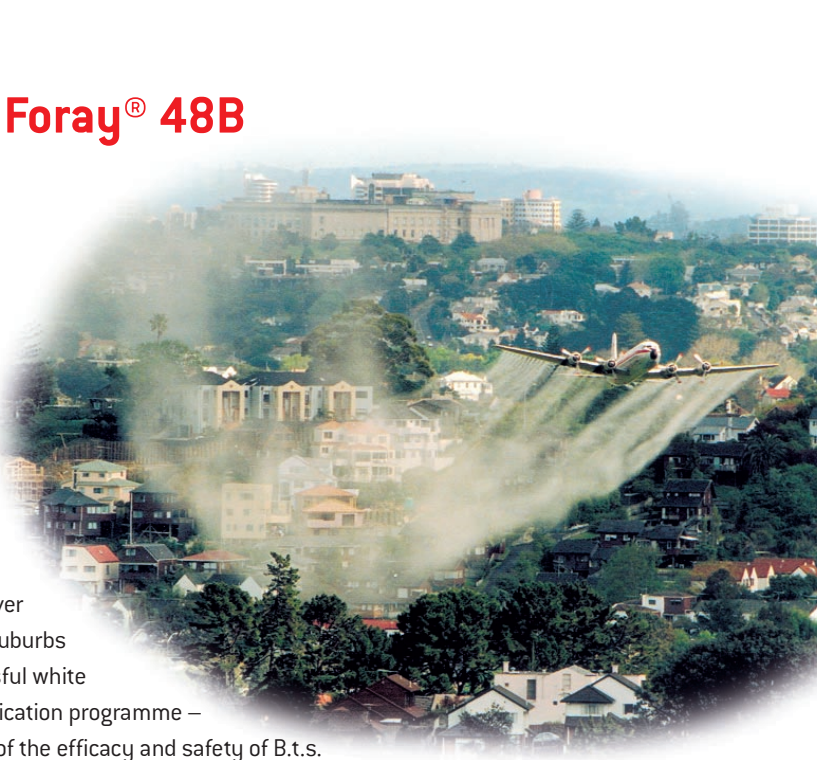
Because of its high level of efficacy and its environmental acceptability VectoBac 12AS is rapidly gaining popularity in mosquito control programmes at our ports and airports.



## Foray® 48B

This formulation of B.t.k. is approved to combat any incursion of Asian gypsy moth into New Zealand.

Foray 48B was the product sprayed over several Auckland suburbs during the successful white tussock moth eradication programme – outstanding proof of the efficacy and safety of B.t.s.



## Foray

Naturally Better  
Against Tussock Moth  
in Auckland

# Getting The Best Out Of Your B.t. Spray

As B.t. must be eaten to be effective, good coverage is essential for good results. Sheltered sites are favourite places for caterpillars to feed. Sufficient spray must reach these parts of the plant for the larvae to eat enough spores and crystals to be killed. High water volume spraying and a non-ionic wetting agent are recommended to ensure good coverage.

Caterpillars are more easily killed when they are small. Use B.t.s at an early stage of crop development before damage is severe, when larvae are small and good coverage is easier. The use of 'soft' B.t. sprays at this stage of the crop also encourages the presence of beneficial parasites and predatory insects.

Although Valent Biosciences Corporation's B.t. products are especially formulated and packaged to maximise their shelf life, they are still biological agents whose activity can be impaired by high temperatures. B.t.s should be stored in tightly sealed containers in a cool dry location. Liquid formulation of B.t.s are better stored for long term under refrigeration.

Often a range of rates is recommended for the B.t. Use the low rate when larvae are small, the pest population is low, or the spraying interval is short. Increase the rate when larvae are larger or pest numbers are high.

B.t. products are broken down naturally in the environment. They are typically active for 3-7 days depending on rainfall, UV degradation and plant growth dilution. On vegetable crops sprays should be reapplied every 5-7 days, and especially after heavy rain or irrigation. On most fruit crops sprays should be reapplied every 7-14 days.

The best time to spray is late afternoon or evening when caterpillars are feeding and UV breakdown is minimised. Water pH should also be considered. Highly alkaline water (greater than pH 8) should be buffered within the range of pH 4-8 to avoid destroying the B.t.



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