



NIMITZ[®]
Product Guide



ADAMA

Simply. Grow. Together.



Revolutionary Control

A unique new tool for nematode management providing:

- Real nematode control through rapid contact action
- Simple, safe and effective application options at low rates
- Maximised crop potential and greater grower returns
- Minimal impact on beneficial and non-target species.

Nematodes

Nematodes – also known as roundworms or eelworms – are the most numerous multicellular animals on the planet, numbering more than 28,000 known species. With soil samples often containing in excess of millions of individual nematodes per square metre, it is estimated they account for around 80% of all individual animals on earth. Nematodes may be saprophytic (feeding on broken down organic matter), predaceous (feeding on other nematodes, bacteria, fungi or even smaller organisms), entomopathogenic (feeding on insects) or parasitic (feeding on plants).

Plant parasitic nematodes are among the most destructive and problematic pests for growers around the world, severely impacting crop development and yield. These nearly invisible killers affect a variety of crops globally and are responsible for an estimated \$125 billion in annual plant losses. Crops in serious danger include Tomatoes, Capsicums, melons and other cucurbits, Carrots, cereals, Strawberries, Potato, Sugarcane, Soybeans, leafy vegetables and many others.

Not all nematodes are responsible for crop damage. Beneficial nematodes include those that feed on soil borne insects, bacteria and fungi that are harmful to plants, making them an important part of the soil microbiology.

The impact of plant parasitic nematodes

Because these organisms are unseen, they can often appear to be less of a threat than they really are. Nematodes typically do most of their work, and damage, invisibly beneath the soil. By interfering with the roots and reducing the plant's ability to extract water and nutrients, crop productivity is invariably affected.

In addition to the direct damage they cause to crops, even in low populations, nematodes enable easy penetration of other soil diseases to roots, further exacerbating problems for the plant. Besides reducing crop yields, nematodes can affect the external appearance of the harvested crops. For instance, nematode infected potatoes appear lumpy, carrots can appear forked and unattractive, and fruiting vegetables can be left vulnerable to be scalded by the sun - all becoming unsuitable for sale.

Nimitz® is a novel nematicide developed globally by Adama. Nimitz® has been extensively trialled around the world since 2007 and more than a thousand trials have been conducted across 23 countries, over all continents, in multiple crops and on various nematode types and species.

In field trials, Nimitz® has consistently demonstrated equivalent or better nematode control when compared with the registered standard nematicide or fumigant and in many trials, the greater nematode control achieved by Nimitz® has resulted in a significant increase in marketable yield.

Nimitz® is registered in Australia for use in Capsicum, Chilli, Carrot, Cucumber, Eggplant, Honeydew Melon, Okra, Potato, Pumpkin, Rockmelon, Squash, Sugarcane, Tomato, Sweet Potato, Watermelon and Zucchini with development work continuing extensive list of other crops.





Nimitz[®] at a glance

Active ingredient	480 g/L fluensulfone
Chemical name	5-Chloro-2-[(3,4,4-trifluoro-3-buten-1-yl)sulfonyl]thiazole
Chemical Group	heterocyclic fluoroalkenyl sulfones
Registered Crops	Capsicums, Chillies, Eggplant, Tomatoes, Okra, Carrots, Potatoes, Sweet Potatoes, Sugarcane and cucurbit crops
Target Pest	Root-knot nematode
Formulation Type	Emulsifiable Concentrate (EC)
Application Rate Range	4 – 8 L/ha

Key features

- True nematicidal control
- Fast acting and unique mode of action
- Simple, safe and effective application options at low rates
- Minimal impact on beneficial and non-target species.

Mode of action

Fluensulfone belongs to a unique new chemical class with a new Mode of Action. Studies have shown that fluensulfone is a true nematicide that kills the target by contact, rather than temporary nematostatic (paralysis) activity as seen with current organophosphate and carbamate chemistry.

Nimitz[®] has rapid activity on nematodes. Within 1 hour of contact nematodes cease feeding and quickly become paralysed. Fluensulfone requires 24 - 72 hours to achieve complete mortality.

Any nematode eggs laid after exposure to Nimitz[®] are likely to be unviable, or if juveniles do hatch, they do not survive.



Root-knot nematode larvae penetrating a tomato root. Once inside, the larva establishes a feeding site, which causes a nutrient-robbing gall. Photo by William Wergi

Target species

Root-knot nematode

The Root-knot nematode (RKN) group get their name from the characteristic formation of root galls on affected plants and are among the most damaging of plant-parasitic nematodes.

In Australia, there are five relatively widespread Meloidogyne species (*M. javanica*, *M. incognita* and *M. arenaria* in warm climates and *M. hapla* and *M. fallax* in cool climates).

They are capable of attacking a wide range of plants and can cause economic damage to crops with as few as 1 - 2 nematodes per gram of soil.

In Australia, RKNs have been reported to attack scores of different plant families including some of our biggest crops; Cucurbitaceae (Cucumbers, Melons, Squash, Zucchini), Solanaceae (Capsicums, Tomatoes), Fabaceae (Chickpeas, Soybeans, Peas, Beans, Lucerne), Musaceae (Bananas), Poaceae (Wheat, Barley, Corn and Rice), Vitaceae (Grapes), Sugarcane and Malvaceae (Cotton). The level of susceptibility varies in each host.



The characteristic root galls produced by RKN infested plants are outgrowths of the roots themselves. Photo by Steve Tancred

Adult female RKNs live inside the root gall where they feed, mature and lay eggs.

Root-knot nematode damage most often results in poor growth and reduced resistance to other problems such as moisture stress and disease. High enough levels of damage early on can lead to total crop loss.

The diminished capacity of the roots due to galling usually leads to a reduction in the number of leaves - and therefore a decrease in photosynthetic ability - a reduction in flowering, and subsequent decrease in the yield of fruit produced.

Symptoms most visually obvious above the ground may include stunted plant growth, yellowing of the leaves and wilting on hot days as plants struggle to draw moisture from the soil effectively.

Root lesion nematodes

Nimitz is registered for the control of root lesion nematodes (RLN) for sugarcane only. The RLN species that cause serious damage to the sugarcane is *Pratylenchus zeae*. RLN are an important pest as they occur in all type of soil (while RKN are mostly present in light, sandy soils). The damaged root system limits the ability of the plant to access moisture and nutrients, resulting in slower stalk growth and reduced crop yield.

Application

Nimitz® can only be used prior to transplanting seedlings with at least 2 true leaves and should not be used prior to direct seeding these crops.*

Table 1. Fruiting Vegetables

Crop	Pest	Rate/ha
Transplanted crops: Cucurbits, Tomatoes, Capsicum, Chilli, Eggplant, Okra	Root-knot nematode (<i>Meloidogyne</i> spp.)	4 – 8 L

Table 2. Root and tuber vegetables

Crop	Pest	Rate/ha
Carrots, Potatoes, Sweet potatoes	Root-knot nematode (<i>Meloidogyne</i> spp.)	4 – 8 L

Table 3. Sugarcane

Crop	Pest	Rate/ha
Sugarcane	Root-knot nematode (<i>Meloidogyne</i> spp.), Root lesion nematode (<i>Pratylenchus zeae</i>)	4 L

*Refer to website for up to date Product Label which may include new crops in future.

Timing

Nimitz® may be applied by either broadcast or banded boomspray application, or via drip irrigation. These application methods are similar to application techniques for existing registered nematicides, so no new machinery or application equipment will be required for those who are already users of these products. Application must be made to well prepared, bare, moist soil 7 days prior to the transplanting of seedlings in treated areas and must be incorporated either mechanically to a depth of 15 - 20 cm for broadcast/boomspray applications, or with sufficient irrigation to deliver the product to the future root-zone.

Use Rates

Nimitz® is applied at a rate range of 4 - 8 L/ha. The choice of use rate is dependent on the level of expected nematode numbers, cropping history, varietal susceptibility to nematodes and other factors. Use the highest rate of Nimitz® when crops are most vulnerable and marketable yield is of high priority. The lower rate of Nimitz® may be used for nematode population maintenance in conjunction with a range of other nematode management strategies.

Compatibility Classification Nimitz Nematicide 8.0 L/ha Rate

Partner Product	Rate/ha	Water L/ha	Classification
Metham	800 L	0	Compatible
Metham	500 L	0	Compatible
Metham	800 L	400	Caution
Metham	500 L	400	Caution
Strikeout	2.0 L	60	Compatible
Pyrinex Super	1.88 L	60	Compatible
Venom 240	156 mL	60	Compatible
Kohinor 350	1.44 L	100	Compatible
Albatross 200	65 mL	60	Compatible
Jubilee 500	500 mL	60	Compatible
Serenade Prime	7.0 L	200	Compatible

Broadcast Application

Nimitz® may be applied using coarse droplets from conventional spray equipment and a minimum of 200 litres of water per hectare to obtain a uniform application. Once applied, mechanically incorporate as soon as possible to a depth of 15 - 20 cm to insure even distribution. Rainfall or a light irrigation of 10 - 15 mm of water within 1 - 5 days after application may increase efficacy.

Banded Application

The amount of product required for a banded application will vary with the width of the planting bed and row length. Rates need not be concentrated in the row, but should be applied based on percentage of the area treated. For example, if only treating a bed width of 50 cm in a field with 1 metre row spacings (50%), the actual rate of Nimitz® applied per hectare grown is half the sprayed hectare rate (2 L/ha rather than 4 L/ha, or 4 L/ha rather than 8 L/ha).

Drip Irrigation

Nimitz® can be added directly to sub-surface irrigation systems when applied with sufficient water and duration to uniformly wet the entire bed width and root zone (15 - 20 cm deep) where crops are to be planted. The amount of water needed for an application will depend upon the initial level of soil moisture, the soil type, % organic matter and condition, and the placement of the drip tape as well as drip tape emitter spacing etc. Again, rates need not be concentrated in the row, but should be applied based on percentage of the area treated as for banded application.

Rainfastness

Since Nimitz® is being applied to soil and requires moisture to assist in its incorporation and activation, light rain that falls immediately after or even during application is unlikely to reduce its efficacy. Extremely heavy rain that moves Nimitz® away from or below the targeted zone before it has had time to be effective may mean a reduction in nematode control. Avoid application during rain or when heavy rain is forecasted within the next 24 - 48 hours.





In Furrow

In Sugarcane, apply a single application of Nimitz® as a spray into the furrow at planting. Use a spray nozzle that will deliver a coarse spray quality in a minimum volume of 100 L/ha, in a band 30 – 50 cm wide over the centre of the row immediately prior to soil cover being brought in over the sett.

Harvest Withholding Period

No harvest withholding period applies to Nimitz® when used as directed. Growers should note that suitable Maximum Residue Levels (MRLs) or import tolerances may not be established in all markets for produce treated with Nimitz®. If you are growing produce for export, please check with Adama for the latest information on MRLs and export tolerances before using this product.

Rotational Cropping Restrictions

Growers may plant an area treated with Nimitz® with a registered crop such as Tomatoes, Capsicums or cucurbits without restriction. Growers applying Nimitz® must observe the following plant-back (recropping) intervals:

Crop	Plant-back interval
Cover crops (green manure crops) and pastures	No restriction
Cucurbits, Tomatoes, Capsicum, Chilli, Eggplant, Okra, Carrots, Potatoes, Sugarcane, Sweet Potatoes	
Other non-root/tuber vegetables	30 days
Other root and tuber vegetables	180 days
Oats and eaten hay	2 years
All other crops not for export	180 days

Grazing Withholding Period and Export Slaughter Interval

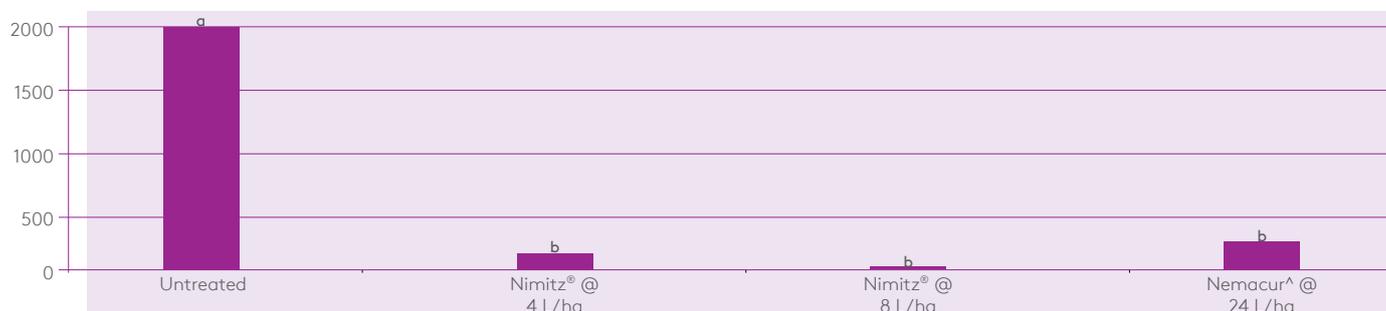
No harvest or grazing withholding period applies to Nimitz® when used as directed.



Trial Results

Effective Nematode Control

Number of 2nd stage RKN juveniles in 200 mL of soil 103 DATP



cv 'Plato' Capsicums - Stanthorpe QLD, 2010/2011. Conducted by Orchard Services - Steve Tancred
Means depicted by columns with data labels of the same letter are not significantly different at the 5% level according to LSD test.

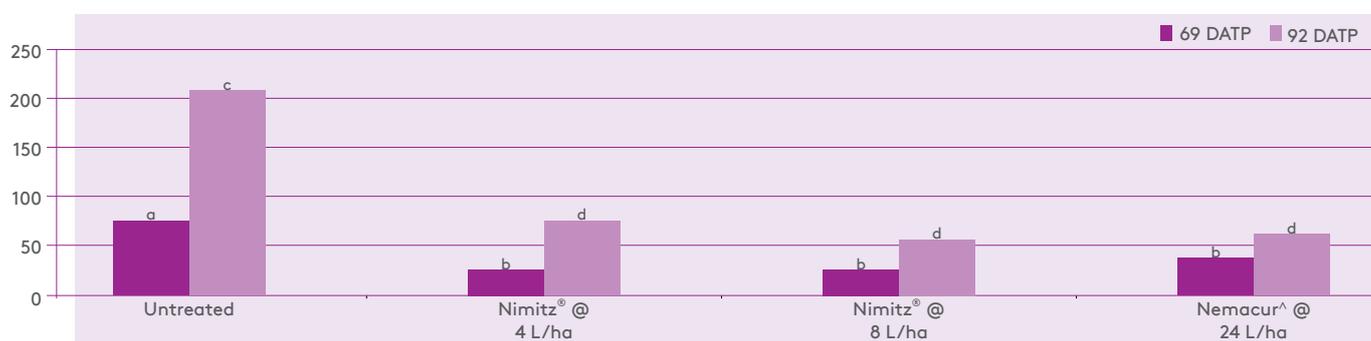
^Note - Nematicur is a registered trademark and is now de-registered for this use.

Conclusion from this and other trials

Nimitz® provides control of RKN in capsicums as efficaciously as the current standard when applied at 4, 6 and 8 L/ha. Trials commonly display a clear rate response with 4 L/ha providing satisfactory reduction in nematode numbers under low to moderate pressure and 8 L/ha providing the most robust level of control under more testing conditions.

Risk Management

Number of Root Galls/Plant



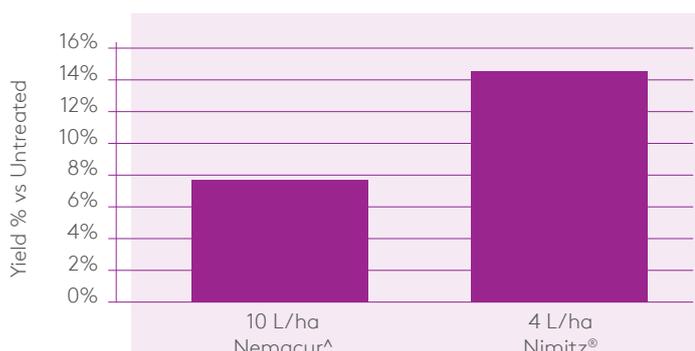
cv 'Plato' Capsicums - Stanthorpe QLD, 2010/2011. Conducted by Orchard Services - Steve Tancred
Means depicted by columns with data labels of the same letter are not significantly different at the 5% level according to LSD test.

^Note - Nematicur is a registered trademark and is now de-registered for this use.

Conclusion from this and other trials

Nimitz® reduces root gall numbers from RKN in capsicums as effectively as the current standard when applied at 4 and 8 L/ha when applied at low to moderate nematode levels. Trials commonly display a clear rate response with 4 L/ha providing satisfactory reduction in nematode root galling under low to moderate pressure and 8 L/ha providing the most satisfactory level of gall reduction under more testing conditions.

Nimitz® Sugarcane Yield (%) results 4 trial average



Conclusions from these trials and other trials

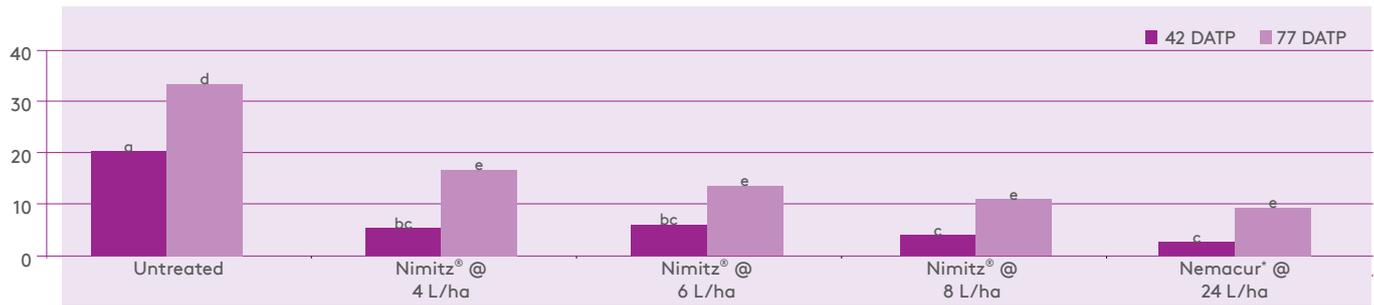
In Sugarcane based on a 4 trial average, a single application of Nimitz® at the rate of 4 L/ha have contributed to a 15% yield increment vs the untreated control whereas Nematicur application at the rate of 10 L/ha have contributed to a 7.7% yield increment vs the untreated control.

FZ-13-N01-13-Mackay, FZ-13-N01-14-South Ballina, FZ-13-N01-15-Oakenden, FZ-13-N01-16-Burnett Heads

^Note - Nematicur is a registered trademark and is now de-registered for this use.



Risk Management Mean Root Galling Index

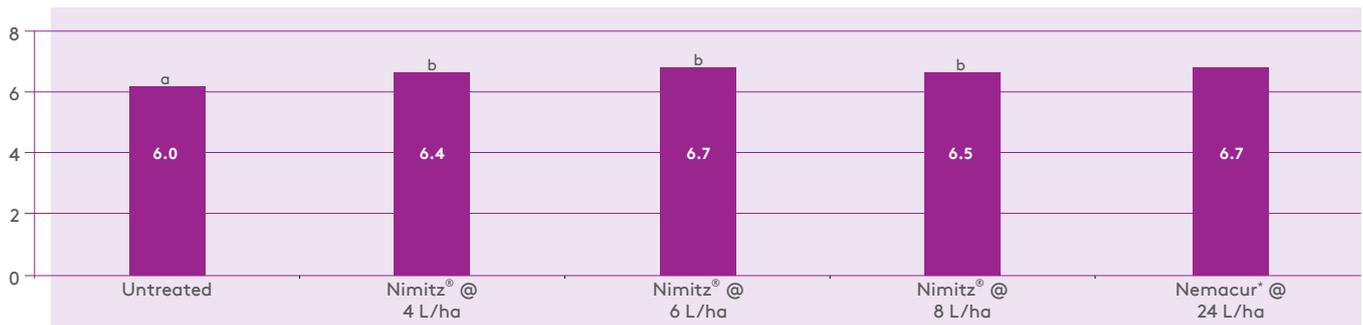


cv 'Pinnacle' Tomatoes - Bowen QLD, 2011. Conducted by Peracto - Chris Monsour
Means depicted by columns with data labels of the same letter are not significantly different at the 5% level according to LSD test.

Conclusion from this and other trials

Nimitz® reduces root galling damage from RKN in fruiting vegetables in the establishment phase of cropping as effectively as the current standard and even later into the crop when applied at 6 and 8 L/ha. Trials commonly display a clear rate response with 4 L/ha providing satisfactory reduction in nematode root galling under moderate pressure and 8 L/ha providing the most satisfactory level of gall reduction under higher pressure.

Improved Grower Returns Mean Fruit Weight kg per Plant



cv 'Pinnacle' Tomatoes - Bowen QLD, 2011. Conducted by Peracto - Chris Monsour
Means depicted by columns with data labels of the same letter are not significantly different at the 5% level according to LSD test.

Conclusion from this and other trials

Whilst there is a trend for more **numbers** of fruit on treated plants, the difference is not significant. However, the **weight** of fruit harvested from Nimitz® treated plots was significantly higher than the untreated control and equal to the Nemacur treated plot in this trial and in the majority of yield trials performed increases in yield ranged from 10 -28%.

Root galls are rated according to Zeck's Scale (Zeck, 1971) and given a 0-to-10 value:

0 = no galls	5 = 25% of roots severely galled
1 = very few small galls	6 = 50% of roots severely galled
2 = numerous small galls	8 = no healthy roots but plant is still green
3 = numerous small galls of which some are grown together	9 = roots rotting and plant dying together
4 = numerous small and some big galls	10 = plant and roots dead

Root Galling Index Calculation#

$$\text{Galling index} = \frac{\sum[\text{number of plants in each rating} (\text{rating value})]}{(\text{number of plants assessed}) (\text{highest rating value})} * 100$$

The Mean Root Galling Index takes into account the level of gall damage per plant along with the number of plants sampled and the worst damage rating in each plot.

Resistance Management

Whilst it is the generally held opinion that the development of nematode populations significantly resistant to existing nematicides and fumigants has not been observed under field conditions to date, the occurrence of 'accelerated degradation' of these compounds in soil has been well documented.

Accelerated degradation refers to the breakdown of these active ingredients and their metabolites at rates that are faster than those commonly seen and high enough to significantly reduce or totally eliminate the usefulness of the nematicide when applied to a particular soil.

Accelerated degradation may occur as a result of an increase in soil pH – when lime is applied to soil for instance - or via 'enhanced biodegradation' where microorganisms have adapted - after exposure to a chemical over a long term through repeated applications to that soil – and are able to metabolise the product.

Whilst fluensulfone is not prone to accelerated degradation due to pH, in order to reduce the potential of Nimitz® efficacy being reduced by enhanced biodegradation, Nimitz® should not be used as the only nematode control measure and should be limited to one application per crop, with a maximum of 8 L/ha in total per year.

Fluensulfone provides an important tool for the management of parasitic nematodes when used in an Integrated Management Strategy, and may assist in extending the usefulness of other traditional nematicides whilst they are still available.

Features

- Excellent control of key nematode pests in Tomato, Capsicum and cucurbit crops
- Applied using existing nematicide application methods
- Long term control when used as part of a Nematode Management Strategy
- Narrow activity spectrum and IPM compatible.

Benefits

- Maximised crop potential and greater grower returns
- No additional application equipment investment required
- Confidence that effective nematode control will be achieved now and into the future
- Highly effective against susceptible nematodes, but with minimal impact on non-target and beneficial species.



Healthy Rockmelon roots - Zecks Gall rating for RKN=0.



Untreated



Nimitz® Treated

Nimitz® Untreated v Treated Capsicum 84DAT



Management Options

There are a range of management options available for controlling Root-knot nematodes, and successful strategies will usually involve the combination of several of these.

Nematicides

Application of either fumigant or contact nematicides has been a standard practice for many growers of susceptible crops in nematode prone areas for over 50 years and in many areas, using synthetic chemistry to reduce the impact of RKN remains an effective option and an integral part of nematode management strategies.

The availability of Nimitz® with its fast acting, unique Mode of Action will ensure that chemical options remain a key tool of nematode management.

The use of other traditional nematicides usually requires strict safety procedures and in some cases special application equipment or even a licenced applicator.

Resistant Varieties

Choose varieties that have been selected for their ability to withstand or repel nematode damage and reduce the survival of nematode populations.

Whilst the number of varieties available is increasing and in some cases extensive e.g. processing Tomatoes, options are still limited for many crops and may not suit all growing regions.



For further information on management options and a copy of the booklet *Management of Root-Knot Nematode in Vegetable Crops* scan your QR reader.

Crop Rotation

Grow resistant crops in rotation with susceptible or tolerant crop species.

Resistant crops reduce the survival of nematode populations. Tolerant crops will not in themselves diminish nematode populations but will not suffer serious yield loss.

Careful planning is required in order to be effective, and alternative crops may not always be as suitable or provide acceptable returns for the grower in that growing season.

Farm Hygiene

The use of nematode-free seedlings and good farm sanitation such as cleaning machinery and equipment before moving between fields and between farms can help reduce the spread of RKN.

Weeds that are also susceptible to RKN can act as hosts, maintaining a bridge between crops, so keeping fields and other areas on farm as weed free as possible will assist in keeping nematode population levels low.

Biological Control and Soil Amendments

The addition of organic matter in the form of manure has been shown to provide a yield benefit not only from the increased availability of nutrients but also due to the suppression of plant pathogens including nematodes.

Access to quality weed-free material, the volume required, and the need for what can be a labour intensive exercise can mean that this is not always a preferred option.



Frequently Asked Questions

What is a nematode?

Nematodes are microscopic organisms also known as 'roundworms' or 'eelworms'. Nematodes may be microbivorous (feeding on bacteria or fungi), predaceous (feeding on nematodes and other small animals), entomopathogenic (feeding on insects) or plant-parasitic (feeding on plants).

Would I know a nematode if I saw one?

Nematodes can't be seen by the naked eye. They live in the free water that surrounds soil particles but even though they are microscopic, some nematodes can move up to a metre in soil in a year. They are attracted to the root exudates of plants and can migrate from untreated areas in between rows into the root zone during the growing season.

How will I know if nematodes are a problem for me?

The most prominent nematode pests of vegetable crops locally are members of the *Meloidogyne* genus. In Australia, there are five relatively widespread Root-knot nematodes (RKN) including *M. javanica*, *M. incognita* and *M. arenaria* in warm climates and *M. hapla* and *M. fallax* in cool climates. RKN juveniles enter plant roots which induces root cells to expand and form "giant cells" on which the RKN feed. The giant cells enlarge and visible galls are formed from tissue that surrounds these cells. These galls can be seen if you remove an affected plant and inspect its roots.

Galls disrupt the xylem vessels and the roots cannot function normally with respect to water and nutrients, resulting in above ground symptoms of nutrient deficiency and/or disease and most likely poor irrigation efficiency and yield loss.

The use of nematode monitoring techniques is an important step in understanding what threat RKN pose and what action to take. Manual testing can be carried out using traditional sampling techniques and laboratory analysis or using SARDI Predicta Pt test (DNA extraction). RKN populations detected should then be compared to acceptable thresholds and a management action plan implemented if required. Fields should later be re-sampled to check that the control measures have been effective.

What is Nimitz®?

Nimitz® is a contact nematicide applied prior to transplanting seedlings of Tomatoes, Capsicums, Chilli, Eggplant, Okra and cucurbit vegetables. It is intended for use in fields where nematode damage is preventing growers from reaching the full potential of a crop, whether fields were previously untreated or as replacement for current nematicides. Nimitz® provides an unmatched combination of safety and efficacy, thereby simplifying several aspects of nematode management.

What is fluensulfone?

Fluensulfone is the active ingredient in Nimitz® - a new molecule from a new chemical class known as heterocyclic fluoroalkenyl sulfones.

Who discovered fluensulfone and when?

Fluensulfone was discovered in Japan and quickly showed significant promise for use as a replacement to outdated carbamate and organophosphate nematicides. The development project was taken on by Adama (formerly Makhteshim-Agan) in 2006 and now after thousands of trials conducted in 23 countries over all continents, fluensulfone has consistently demonstrated equal or better nematode control when compared to the best commercial standard.

Is Nimitz® a fumigant like some other nematicides?

Unlike some older chemistry, Nimitz® is not a fumigant. The active ingredient is distributed through the soil and into contact with nematodes through water movement via irrigation or rainfall following application.

Is Nimitz® already registered and in use around the world and if so, which countries?

Nimitz® is now registered in the USA, Israel, Brazil, Mexico, India and Australia for use prior to transplanting solanaceous and cucurbitaceous crops with other countries also working toward registration including Canada, Japan, South Africa and many others.





Using Nimitz®

How does Nimitz® control plant-parasitic nematodes?

The fluensulfone in Nimitz® acts quickly and within 1 hour of contact, target nematodes cease feeding and quickly become paralysed. Within 24 - 72 hours complete mortality is achieved, rather than nematostatic or temporary paralysis. Unlike activity seen when using current organophosphate and carbamate chemistry - which allows nematodes to 'unfreeze' when the nematicide passes through the soil profile in time - the action of Nimitz® is irreversible.

Why is the 480 EC formulation chosen for Australia?

We have chosen an Emulsifiable Concentrate liquid in Australia for its effectiveness and to allow Nimitz® to be simply applied as per current practices for many growers here. Nimitz® is likely to be available in several formulations around the world, engineered to accommodate local agricultural practices in different crops and countries.

Is Nimitz® safe to users and the environment?

Nimitz® is scheduled as an S6 Poison meaning it does have to be treated with respect when handling the product, but does not require the Personal Protective Equipment which is mandatory when applying alternative S7 Dangerous Poison nematicides. Nimitz® has a very favourable toxicological and ecotoxicological profile and is considered non-toxic to birds, bees and aquatic life.

Is there a minimum re-entry interval when using Nimitz®?

The REI when using Nimitz® is 12 hours.

Which nematode life cycle stages does it affect?

Nimitz® affects all active stages of the nematode life cycle by inhibiting the feeding and motility of adults and juveniles and the laying, hatching and development of eggs.

Is soil temperature a factor to be considered when applying Nimitz®?

Nematode species become active at different soil temperatures. *Meloidogyne incognita* becomes active when soil temperatures reach 15.6°C. Below this temperature, the immobile nematode does not absorb Nimitz® and may not be affected. Soil temperatures should be monitored, particularly in early spring when temperatures may be insufficient for nematode activity and thus reduce efficacy.

Which nematode species will be controlled by Nimitz®?

Nimitz® is registered for the control of Root-knot nematodes and also Root lesion nematodes in sugarcane. extensive testing has shown that many other species of plant-parasitic nematodes in Australia are susceptible including:

- Root-knot nematode - *Meloidogyne incognita*, *M. hapla*, *M. arenaria*, *M. fallax* and *M. javanica*
- Root lesion nematode - *Pratylenchus zeae* and *P. brachyurus*
- Golden potato cyst nematode - *Globodera rostochiensis*
- Cereal cyst nematode - *Heterodera avenae*
- Stubby root nematode - *Trichodorus spp*
- Citrus nematode - *Tylenchulus semipenetrans*

What effect on other soil micro flora does Nimitz® have?

Nimitz® is unique among nematicides in that it only targets nematodes without disrupting the balance of the soil ecosystem. Healthy, fully functioning soil is balanced to provide an environment that sustains and nourishes plants, soil microbes and other beneficial organisms. Managing for soil health is one of the most effective ways to increase crop productivity, profitability and sustainability.



How long does Nimitz® control nematodes for?

The aim of nematicide treatment for fruiting vegetables is to reduce the initial nematode population in the root zone and allow plants to develop a vigorous root system that can withstand later-season migration of nematodes without affecting crop yield or quality.

Nimitz® has been proven to control the nematodes in the treated zone long enough for crops to establish and thrive and to improve fruit yield despite later incursions from untreated areas. By significantly reducing early nematode damage, Nimitz® is able to increase yields in Tomato, Capsicum and cucurbit crops by 10 - 30% when compared to untreated crops, depending on the level of RKN infestation.

Does residual control last longer on lighter soils or heavier soils? Is pH a factor?

The half-life (DT_{50}) of fluensulfone varies from 7 - 17 days, according to soil type. The length of effectiveness in light soils is slightly shorter than in heavy soils. The activity of Nimitz® is not affected by soil pH and there is no need to adjust the pH of water used to apply Nimitz®.

Resistance Management

What pressure is currently on nematicides in terms of resistance developing around the world and here in Australia? What is 'accelerated degradation' and how does it affect current nematicides in soil?

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Fluensulfone provides an important tool for the management of parasitic nematodes when used in an Integrated Management Strategy, and may assist in extending the usefulness of other traditional nematicides whilst they are still available.

Will Nimitz® form part of a Resistance Management Strategy?

As always, an integrated approach should be adopted to reduce the pressure on any one management practice. Relevant measures include the use of healthy seedlings (insect, pathogen and nematode-free), planting nematode resistant varieties when available, rotation with alternative crops that do not favour the survival of Root-knot nematodes, removal and destruction of volunteer seedlings from susceptible crops and other weeds, avoiding carryover of nematode contaminated soil between sites and the promotion of optimal growing conditions for the crop to increase tolerance to nematode infections.

For further information on management options and a copy of the booklet 'Management of Root-Knot Nematode in Vegetable Crops', visit adama.com.

Compatibility

Which soil applied insecticides, fungicides and herbicides is Nimitz® compatible with if any?

Nimitz® may be applied in tank mixes with other products registered for application 7 days prior to transplanting Tomato, Capsicum and cucurbit seedlings.

The suitability of mixing partners should be considered carefully based on the timing of the Nimitz® application and the need for any subsequent irrigations to incorporate and dissipate the Nimitz® prior to transplanting.

Do not apply Nimitz® with any other product before testing for physical and chemical compatibility of the mixture. To determine compatibility, pour the recommended proportions of the product(s) into a suitable container. After mixing, wait 30 minutes and check to see if the product remains mixed. If the product remains mixed, it is considered physically compatible. Read and carefully observe the most restrictive labelling limitations and precautions of all products used in any tank mix.

Can I mix Nimitz® with liquid fertilisers? Will any mixtures have adverse crop effects?

A list of compatible mixing partners is presently being considered, however, due to the variable nature of some liquid and soluble fertiliser products, a physical compatibility test as above should be performed.

Also, the effect on efficacy of soluble fertilisers after application of Nimitz® and any subsequent irrigations to incorporate and dissipate the Nimitz® prior to transplanting should be considered.





Application Timing and Crop Safety

When do I apply Nimitz®?

Transplanted crops are most vulnerable just after planting, when the plant is not yet established and any damage to the roots can cause a delay in crop development or make roots vulnerable to disease infection.

Once parasitic nematode species have penetrated a root, control with any nematicide is more difficult. By applying Nimitz® to a well-prepared, weed-free bed 7 days prior to transplanting seedlings, growers are able to effectively target the pest.

Can I use my current application equipment?

Application is as simple as applying via drip irrigation in the same way many other nematicides, insecticides and fertilisers are currently added. Alternatively, you can broadcast or band-spray with a boom – as you might with a residual herbicide – and then incorporate into the soil where the nematodes are and the seedlings are to be transplanted.

What rate of Nimitz® should I choose?

Based on extensive testing, a rate range of 4 to 8 litres per hectare of Nimitz® 480 EC is registered to control Root-knot Nematode. Suitable efficacy has been achieved with rates of Nimitz® at the lower end of the range when used under low to moderate RKN infestation in soils that have been prepared well in conjunction with a thorough nematode management strategy.

When RKN numbers are likely to be higher - or indeed have been tested and shown to have greater than 100 RKN per 200 mL of soil - it is recommended that the 8 L/ha rate of Nimitz® is chosen.

A maximum of 8 L/ha of Nimitz® may be used per year in any one treated area and only 4 L/ha of Nimitz® per year in Sugarcane.

Which application method provides the best results in terms of nematode control?

The aim of any Nimitz® application is to create a nematode-free zone within the bed for the early-season root system to grow uninhibited by nematode attack. The most effective application method is therefore that which is capable of incorporating Nimitz® throughout this zone at the required use rate for the area being treated.

The application options for Nimitz® have been developed to accommodate preferred grower practice – which usually takes into account soil type, machinery available and irrigation method among other factors.

All application methods have been thoroughly tested and proven to be effective. However, when performed correctly, broadcast application followed by incorporation and bed-shaping - which pulls much of the treated soil into the raised bed is perhaps the most effective means of ensuring that Nimitz® is distributed where it should be.

Does the Nimitz® stay in this area indefinitely? How long does it work for and what is its half-life in the soil?

Nimitz® has a half-life of 7-17 days in soil, so it does its job and moves on. This relatively short half-life is one reason why fluensulfone is ecologically friendly.



How do I calculate the amount of Nimitz® to be applied via Broadcast Application?

When a broadcast application is made, and beds are formed after incorporation, the rate applied should be reduced by the percentage of the area between beds. For example:

80 cm bed-top on 180 cm centres = $80/180 = 44$ percent X 8 L/ha rate = 3.6 L/ha broadcast

100 cm bed-top on 200 cm centres = $100/200 = 50$ percent X 8 L/ha rate = 4 L/ha broadcast

When incorporated correctly, the broadcast method gives the most accurate Nimitz® application rate for efficiency and reduces overexposure to the developing transplant. The 'treated area' used to calculate the applied rate is always less than the actual planted area due to the untreated inter-row.

How do I calculate the amount of Nimitz® required when using Drip Application?

Initial soil moisture must be at a level to allow the product to move uniformly from shoulder to shoulder and throughout the bed as it is being drip irrigated.

The calculation of rate for drip application is based on knowledge of irrigation efficiency/coverage of each drip system in a specific soil type. If a drip system is able to wet a bed "shoulder to shoulder," then the same fractional formula described above for band application is to be used (calculate percent area treated using percentage surface area of the bed top). The drip-injection rate per hectare would be calculated based upon the bed width. If the irrigation does not wet the whole bed, calculation should be made according to the wet front width.

What if it rains after I have applied Nimitz® as a broadcast spray? Do I still need to mechanically incorporate it?

For optimal performance, all applications must be incorporated by water and/or mechanical means to a depth of 15 to 20 cm.

Soil moisture must be adequate for uniform mechanical incorporation and to support plant growth. While the amount of moisture will vary with soil type, irrigation or rainfall of 20-25 mm 1-5 days after application will increase movement of Nimitz® in the soil, thus increasing efficacy and crop safety.

Heavy rain that moves Nimitz® through the soil profile too quickly, or washes it away from the bed will reduce the efficacy of the application. Do not apply if heavy rainfall is expected within 48 hours.

When is the preferred application timing? Is it possible to apply too early – too far ahead of the planting process?

Trials have shown no significant difference in nematode control between applications of Nimitz® at 7 Days, 14 Days and 28 Days before transplanting. The interval of 7 days prior to transplanting has been chosen to allow time for adequate incorporation through the bed, sufficient time for Nimitz® to effectively treat the nematodes prior to introducing the seedlings and a safety buffer to eliminate any risk of seedling damage.

How quickly do I need to incorporate Nimitz® after broadcast or banded application to ensure that its nematocidal activity is not compromised?

Incorporation is best done immediately to ensure no lost efficacy. Individual circumstances will vary, but Nimitz® has been left for up to 5 days after application without significant loss in nematode control.

Which varieties of Tomatoes, Capsicums and cucurbits has Nimitz® been tested on and proven to be safe? Which varieties, if any, have shown unacceptable levels of damage?

ALL varieties of crops tested in ALL of the growing regions here in Australia have shown NO signs of phytotoxicity even when Nimitz® was applied at double label rates (16 L/ha).

Tomato varieties tested include: cv 3002 (Buronga NSW), cv 3402 (Mildura VIC), cv Ivanhoe (Bundaberg QLD), cv Tiny Tim (Bundaberg QLD), cv Lava (Bundaberg QLD), cv Pinnacle (Bowen QLD), cv Pinnacle (Bundaberg QLD), cv Pinnacle (Alloway QLD), cv Pinnacle (Farnsfield QLD), cv Red Luck (Bowen QLD), cv Danika (Tenterfield NSW), cv Danika (Bundaberg QLD), cv Horsepower (Mildura VIC)

Capsicum varieties tested include: cv Husky (Bundaberg QLD), cv Merlin (Bundaberg QLD), cv Plato (Stanthorpe QLD), cv Plato (Bundaberg QLD), cv Plato (Mildura VIC), cv Warlock (Stanthorpe QLD), cv



Warlock (Bundaberg QLD), cv Aquarius (Mildura VIC), cv Ducati (Bundaberg QLD), cv Ducati (Mildura VIC), cv Wizard (Bundaberg QLD)

Pumpkin varieties tested include: cv Ken's Special Hybrid 864 F1 (Mildura VIC), cv Butternut large (Gunnedah NSW), cv Jap Improved (Stanthorpe QLD), cv Jap Improved (Gunnedah NSW), cv Queensland Blue (Gunnedah NSW)

Squash varieties tested include: cv Sunburst (Stanthorpe QLD), cv Sunburst F1 (Mildura VIC)

Zucchini varieties tested: cv Eva (Bundaberg QLD), cv Regal Black (Bundaberg QLD), cv Regal Black (Peats Ridge NSW), cv Nitro (Mildura VIC)

Rockmelon varieties tested: cv Eastern Star (Bowen QLD), cv Northern Sky (Bundaberg QLD), cv Northern Star (Farnsfield QLD), cv Argyle (Gunnedah NSW), cv Nepean (Gunnedah NSW), cv Sweetlife (Gunnedah NSW), cv Planter's Jumbo (Stanthorpe QLD)

Honeydew Melon varieties tested include: cv Casper (Bowen QLD), cv Casper (Bundaberg QLD), cv Sweet Delight (Bundaberg QLD), cv Beethoven (Gunnedah NSW), cv Catalina (Gunnedah NSW), cv Ivory Star (Gunnedah NSW), cv Glacier (Bundaberg QLD)

Watermelon varieties tested include: cv Minipol (Bundaberg QLD), cv Red Tiger (Bundaberg QLD), cv Storm (Bundaberg QLD), cv Nightshade (Bundaberg QLD)

Cucumber varieties tested: cv Burpless Tasty Green (Gunnedah NSW), cv Camelot (Gunnedah NSW), cv Crystal Salad (Gunnedah NSW)

Sweet Potato varieties tested: cv. Beaugard (Bundaberg QLD)

Sugarcane varieties tested: Q181 (Ballina, Oakenden QLD), Q158 (McKay QLD), Q208 (Burnett Heads QLD)

Since no varieties have yet shown adverse effects, even at 2X maximum label rates, and with many varieties tolerating up to 4X max label rates, we are confident that there will be few if any varieties that show ill-effects from Nimitz® when used according to the label directions.





Summary

The fast acting and unique Mode of Action makes Nimitz[®] a key tool in plant-parasitic nematode management strategies.

Nimitz[®] is safe and easy to apply at low use rates and without specialised equipment or licenced contract applicators.

Nimitz[®] is a long awaited breakthrough in true nematicidal control.

More Information

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