

# Information Sheet

## 8. PESTS

### 8.2.2 Nematode management

Nematodes can be controlled (not eliminated), thus reducing the damage they cause in various different ways. Control methods include chemical nematicides, tolerant varieties, choosing the correct time of planting/ratooning and the use of organic amendments and green manures.

#### Chemical nematicides

The most effective and common control method is the use of chemical nematicides.

#### When is a nematicide required?

The decision to use a nematicide in a plant crop must be based on symptoms of nematode damage in the preceding ratoon crop (see *Information Sheet 8.2.1: Nematodes*) and/or the response to treatment of the cane in test strips in the previous crop. If in doubt, it is advisable to take soil and root samples from problem fields and send it to SASRI for diagnosis.

#### Sampling procedure

Using a spade or auger, collect soil and roots from the base of at least five sugarcane stools within a field. Place all the samples into one plastic bag. Seal the bag and complete the "Nematode Sample Label" form. Fill in the correct details, e.g. farm name, field number, contact details, sugarcane variety, crop age and soil type.

The samples can be either hand delivered or couriered to SASRI in Mount Edgecombe (170 Flanders Drive, Mount Edgecombe, 4300). Alternatively, they can be placed in one of the FAS collection bins or given to your local Extension Specialist to drop off at SASRI. Samples should be as fresh as possible (no more than 3-4 days old) when arriving at SASRI. Samples should not be stored in the office or vehicle and should be kept out of direct sunlight and heat. The results will be e-mailed to growers usually within two weeks of delivery to SASRI.

#### In soils with less than 6% clay

A nematicide should be used to treat cane on poor sandy soils, i.e. where the clay content is less than about 6%, and if the previous crop exhibited typical symptoms of nematode damage above and below ground.

#### In soils with more than 6% clay

Where there is any doubt as to the cause of the symptoms, particularly on less sandy soils, it is advisable to first assess

the value of using a nematicide. This may be done by applying the nematicide to a few rows immediately after harvest. If nematodes are the main factor limiting growth then a clear growth response will be observed in the treated strips within eight weeks. The remainder of the field should then be treated without delay. When cane is harvested and treated in winter the response to treatment may take longer than eight weeks to be discernable.

#### Where a nematicide should be applied?

Application of a nematicide to the plant crop is best applied in the furrow to protect the new roots as they appear from the sett. Treating with a nematicide over the row, once shoots have started to emerge leads to a large number of new, vulnerable roots being untreated. In the ratoon, the nematicide must be applied as soon as possible over the row.

Whenever a nematicide is used, it is advisable to leave a few lines untreated in each field in order to monitor the effectiveness of the chemical in each crop.

Figure 1: Nematode sample label.

## Choice of nematicide

It is important to remember that not all nematicides can be used in all conditions.

The active ingredients of the nematicides registered for use in sugarcane are carbofuran, furfural and oxamyl.

Comparative data on their costs and performance is given in Table 1. The expected yield increase (tRV/ha) has been obtained from trials conducted on sandy soils and are based on the original formulations of these nematicides, namely Curaterr (carbofuran), Cropguard (furfural) and Vydate (oxamyl). However a wide variety of generic alternatives are available.

## Application rate, timing and method of application

Table 2 outlines the rates at which the nematicides should be applied as well as timing and method of application.

## Factors that influence the efficacy of nematicides registered for use on sugarcane

**Soil moisture:** Nematicides should not be applied to very dry soils unless treatment is followed soon by irrigation or rain. Response to treatment is less in a dry season than in a wet season.

**Duration of the crop:** The response to treatment with a nematicide is disproportionately greater in crops grown for more than 13 months than in younger cane. However, the benefit may be lost as damage from the eldana stalk borer is greater in older cane.

**pH:** The active ingredients of most nematicides are rapidly broken down under alkaline conditions. Response to treatment on soils with a high pH (>8) is therefore likely to be less than on other soils. Where lime is required, it should be incorporated in the soil at least six weeks **before** applying a nematicide to the plant crop or, if necessary, top-dressed six weeks **after** applying the nematicide. If calcium and magnesium are deficient,

rather than using lime, these elements can be supplied, without delay, as a top-dressing of gypsum (calcium sulphate) and magnesium sulphate.

**Residual responses:** A residual or carry-over response of about nine tons of cane per hectare following treatment with a nematicide can usually be expected in the subsequent crop on Fernwood series soils. On the better sands, the residual response may be almost as large as the response from re-treating cane. Unnecessary re-application of a nematicide can be avoided by testing the response to retreatment in observation strips.

**Nutrition:** Nutritional deficiencies in the soil should be corrected **before** applying a nematicide.

**Herbicides:** The herbicide Sencor (metribuzin) applied as a pre- or post-emergent spray, is phytotoxic to plant cane growing on poor sandy soils, particularly when Curaterr is applied in the planting furrow.

**Irrigation:** Do **not** apply the granular nematicides (and Vydate SL) through an irrigation system. CropGuard however can be applied through a dripper system. Granules must be incorporated into the soil either mechanically or by thorough irrigation. For sprinkler irrigation apply a minimum of 10 mm irrigation water after applying the nematicide to the soil. For drip irrigation the granules must be applied along the dripper line which must be on, or close to, the cane row. The distribution of the granules should not extend beyond the wetted area. Dripper outlets must be close enough together, and the drip-time long enough, to moisten the soil along the entire length of treated cane. Application of a nematicide in fields with buried dripper lines will require supplementary overhead irrigation.

**Waterways:** Do not apply nematicides to cane rows adjacent to (< 10 m from) waterways, natural watercourses, wetlands or dams to prevent risks of run-off and contamination of the environment.

Table 1. Comparative performance of registered sugarcane nematicides.

		CropGuard	Curaterr 10GR	Vydate 100GR	Vydate SL
Cost (per kg or litre)*		R 43.28	R 38.05	R 74.62	R 137.85
Amount used per ha	Plant cane	50 l	30 kg	30 kg	-
	Ratoon cane	50 l	25 kg	30 kg	9.6 l
Cost per ha - chemical	Plant cane	R 2 164.00	R 1 141.50	R 2 238.60	-
	Ratoon cane	R 2 164.00	R 951.25	R 2 238.60	R 1 323.36
Cost per ha - application**	Plant cane	R 69.40	R 69.40	R 69.40	-
	Ratoon cane	R 69.40	R 456.40	R 69.40	R 69.40
Expected yield increase (t RV/ha)***	Plant cane	1.1	1.4	0.9	-
	Ratoon cane	1.0	1.0	1.1	1.1
Expected profit****	Plant cane	R 1 061.10	R 2 982.10	R 387.50	-
	Ratoon cane	R 761.60	R 1 587.35	R 986.50	R 1 901.74

\*Retail price as at December 2011

**Table 2. Nematicides registered for use on sugarcane, their rates, timing and method of application.**

Chemical	Furfural	Carbofuran	Oxamyl	Oxamyl
Trade name	Cropguard	Curaterr 10GR	Vydate 100GR	Vydate SL
Formulation	90% colourless liquid	10% blue granule	10% green granule	31% green liquid
Rate per hectare:				
Plant : all soils	50L	30 kg	30 kg	-
Ratoon : 1-6% clay	50 L	30 kg	30 kg	9.6 L (in 300L water)
>6% clay	50 L	25-30 kg	30 kg	7.2–9.6 L (in 300 L water)
Time of application:				
Plant	Apply to the soil before planting the setts.	Apply as the last operation before closing the furrow at planting.	Not registered for plant cane	
Ratoon: spring, summer or early autumn harvest	Apply within four weeks of harvesting the previous crop.		Apply once 6-8 leaves are visible	
Ratoon: winter harvest	Apply within 16 weeks of harvesting the previous crop, or immediately after first spring rains. In the warmer, northern irrigated areas the application should not be delayed except during the months of June and July when soil temperatures are low.			
Method of application:				
Plant	Curaterr and Vydate GR: Apply by means of a planter attachment or wheelbarrow applicator in the planting furrow over the setts. Cover immediately. CropGuard: Apply by means of knapsack in the planting furrow before planting the setts. Seal or incorporate to a depth of 20 cm.			
Ratoon	Curaterr: In fields where the previous crop was burnt at harvest, use a two-row tine applicator to apply the granules in a shallow furrow (5-10 cm deep) along both sides of the row. Vydate GR: Apply Vydate GR in a band on the soil surface on both sides or over the cane row. Vydate SL: (registered for ratoon cane only) Apply by means of a knapsack or low pressure tractor mounted boom sprayer onto cane foliage with 6-8 leaves. CropGuard: (registered for irrigated ratoon cane only) Use a knapsack and apply over the ratoon as a row application to land irrigated to field capacity. Irrigate with 10 mm of water directly after application.			

**Trash:** A trash blanket conserves soil moisture, reduces soil erosion, suppresses weeds and can increase yields on sandy soils by about six tons cane per hectare. For most nematicides (except Curaterr), the previous crop could be trashed at harvest. Where Curaterr is used, ideally it should be applied below the soil surface on burnt fields (see Table 1).

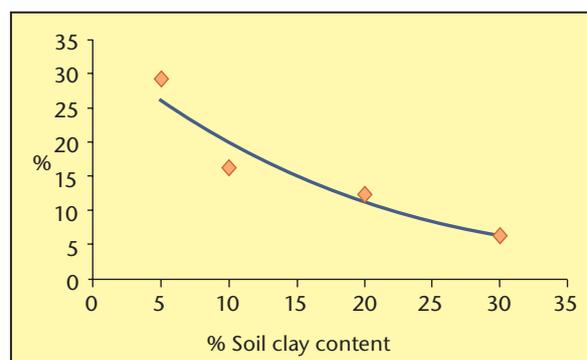
**Clay %:** the response to nematicide decreases as the clay percentage increases. Generally, response to nematicide is 10% or more on soils with 20% clay or less.

### Precautions

Most nematicides are extremely toxic. According to Registration No. L871 (Act No. 36 of 1947), chemical pesticides are classified into different colours (Green: safe, Blue: caution, Yellow: harmful, Red: toxic to very toxic) depending on their toxicity to animals and humans. Two of the nematicides registered for sugarcane are red-label (toxic) products viz. CropGuard and Vydate

SL whereas the other two are yellow-label (harmful) products namely Curaterr and Vydate GR.

Very small quantities of the active ingredients can be lethal to animals and humans. Staff should be warned of the dangers associated with these chemicals and animals



**Figure 2: Percentage response to nematicide in various soils.**

should be kept out of treated areas. Always read and adhere to the warnings and precautions stipulated on label booklets which accompany these products.

Appoint and train a responsible person to control the handling and storage of these chemicals. Store them under lock and key, separate from other agricultural chemicals. Do not allow the chemicals to get wet either in storage or while in the applicator. Calibrate all applicators and knapsacks and keep them in good condition to avoid over application or spillages. Minimise the time between opening a container and applying the chemical. Seal containers after use. Empty and clean applicators immediately after the final application for each day. Wear protective clothing (respirator, boots, overall and rubber gloves) when handling the product. For further details see 'Precautions' in the label booklets that accompany these products.

### Tolerant varieties

All released varieties are routinely screened on sandy soils to assess their tolerance/susceptibility to nematodes and response to nematicide. All varieties tested thus far respond well to the use of nematicides, but some respond more than others. N12, treated with a nematicide, is recommended for all sandy soils except where smut may be a problem. N16, N39, N41 and N42 treated with a nematicide, have also performed well in various rainfed trials. A variety is rated for susceptibility to nematodes based on its response to a nematicide.

In the northern irrigated areas, N25, N32 and N41, treated with a nematicide, are recommended for the poorer soils. Without a nematicide, N14, N25 and N32 are preferable to other untreated varieties and even some treated varieties.

The reaction of some of the released varieties to nematodes is shown in Table 3. Note that none of the varieties are resistant.

**Table 3. Reaction of some released varieties to nematodes.**

Intermediate	Susceptible	Highly susceptible
N12	NCo376	N19
N14	N16	N21
N23	N17	N24
N25	N28	N26
N31	N29	N27
N32*	N36	N30
N39	N37	
N40		
N41		
N42		

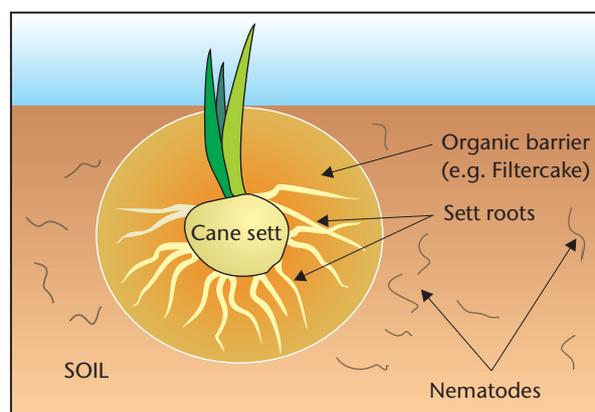
\*N32 was degazetted in 2011

### Time of planting/ratooning

On poor sandy soils under irrigation in Mpumalanga, crop loss from nematodes can be partially avoided by planting and harvesting early in the season (April, May) rather than in spring (October, November). This was observed in varieties N14, N23, N25, N28 and N32. The same principle may also apply to rainfed cane.

### Using organic amendments

The sett roots of plant cane can be shielded from plant-parasitic nematodes by encasing the planted sugarcane setts in an envelope of filtercake applied at approximately 100 tons/ha in the furrow. This provides protection for sufficient time to ensure that the young shoots are well grown before the roots are attacked. When using filtercake in this way a nematicide should not be applied. The effect of the filtercake can persist through to the following crop. Other useful organic amendments include fly-ash and kraal manure.



**Figure 3. Illustration showing sugarcane sett encased in an organic amendment.**

### Green Manures

Growing green manure crops that are poor hosts of sugarcane nematodes is also another recommended practice. These crops (e.g. buckwheat, oats, sunn hemp, velvet beans) will typically be grown for 3-6 months between sugarcane cycles. More information on green manures can be found in the SASRI Green Manuring Bulletin (October 2010).

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