HOME

CROP GUARD IS A POWERFUL NEMATICIDE THAT:

- Kills all harmful nematodes on contact
- Can be applied throughout the growing season
- Leaves no harmful residue on the plant or in the soil
- Can be applied using various methods

Crop Guard is a unique emulsifiable concentrate that has been formulated and manufactured by Illovo Sugar Ltd for the control of nematodes in the soil.

ABOUT US

BACKGROUND

DISCOVERY

Prof. Rodrigo Rodriguez-Kabana is a Distinguished Professor of Nematology at Auburn University, Alabama, USA. He was vice-chairman of the committee that implements the Montreal Protocol, a body that focuses on the removal of substances that deplete the ozone layer. These chemicals include methyl bromide, used extensively in the USA as a soil fumigant.

With the planned phase out of methyl bromide by the Environmental Protection Agency (EPA), Professor Kabana was motivated to find alternatives for soil nematode and fungal control.

He discovered that plants protect themselves naturally by exuding aromatic compounds. Subsequent research into these compounds showed that furfural is a highly effective nematicide & fungicide.

Illovo Sugar, as a large global commercial producer of furfural, became aware of this discovery and in 1995 initiated trials in South Africa though Dr. Cheryl Venter at the Agricultural Research Institute in Potchefstroom. At the time Dr. Venter was also President of the Nematology Society of South Africa. Having established efficacy Illovo then approached Professor Kabana to collaborate jointly in order to further develop this discovery on a global scale.

The active ingredient in Crop Guard, furfural, is manufactured from bagasse (the waste fibre of sugar cane following the extraction of sugar) at Illovo's Sezela Downstream Factory.

RESEARCH

Illovo Sugar embarked on extensive research and development into the efficacy of furfural as a nematicide. Initial field trials were carried out in South Africa and the data generated resulted in Crop Guard being registered with the Department of Agriculture for the control of nematodes on groundnuts and tomatoes.

Subsequently, registration has also been obtained on a range of other crops.
Trials for expanding registration onto additional crops are currently in progress.

CURRENT CROP REGISTRATION

The following crops have been registered:

- Groundnuts
- Tomatoes
- Chillies, Peppers and Paprika
- Ornamentals
- Maize
- Turf
- Onions
- Sugarcane
- Potatoes
- Carrots

NEW REGISTRATIONS

Tobacco data is currently being reviewed by the Department of Agriculture.
Registration trials on citrus, stone fruit and vines are in progress.

Data has also been submitted to the Environmental Protection Agency (EPA) in the USA for the registration of furfural-based formulations.

WHAT ARE NEMATODES?

Nematodes are small cylindrical worms, in most cases microscopic. They are aquatic animals that inhabit oceans and seas, freshwater courses, body fluids, and of particular importance for agriculture, the film of water present between soil particles, and in plants.

They inhabit all types of soil, but appear to favour those with a high sand content, where adequate aeration and quick drainage to field capacity provide optimal conditions for free movement and other activities. Nematodes can survive prolonged unfavourable conditions by entering dormant states.

Plant parasitic nematodes cause an estimated annual loss to agriculture of US $35 billion worldwide and over US $200 million in South Africa.

Existing nematicides are effective, yet they are generally highly toxic and, as they are systemic, require strict withholding periods.

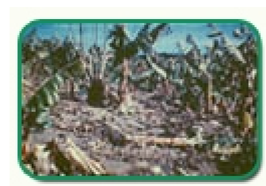
HOW DO THEY AFFECT PLANTS?

Plant-parasitic nematodes feed on the root systems and subterranean structures of plants such as tubers, pods and rhizomes. They feed by perforating plant cell walls with their stylet and withdrawing nutrients through a pumping action into the intestine.

This can cause open wounds on the plant, exposing it to other pathogens such as fungi. They can also create vascular damage that affects the transport of water and nutrients to the plant.

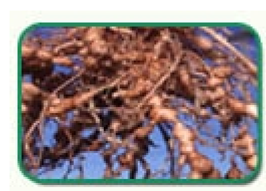
Some induce their hosts to produce nutrients which the nematode can survive on, or enlarged structures in which the nematodes live, or both. Some produce metabolites which kill host tissue. These activities all result in energy being removed from plants to support nematodes. Some plant-parasitic nematodes can cause severe damage that can result in unmarketability of the crop, yield decrease, or even total crop failure.



The feeding habits of plant parasitic nematodes can be placed into two basic categories: ectoparasitic and endoparasitic. Nematodes that act as ectoparasites include those that remain in the soil environment whilst feeding and also those species that penetrate part of their body inside plant tissue. Endoparasitic feeding refers to the complete penetration of the nematode into plant tissue.





WHAT IS SMART FARMING?

It is farming in such a way that your inputs are optimised to result in the best possible yields and profits. It means not relying on rules of thumb, fixed application schedules or general recommendations, but making decisions based on facts.

For example: collecting data on nematode populations in your soil and analyzing this to make informed decisions about when, and to what extent, to intervene.

CROP GUARD AND SMART FARMING

Crop Guard is a smart nematode killer that is ideally suited to Smart Farming practices.

Crop Guard is a smart option because:

- it is a powerful and effective contact nematicide
- it is non systemic and therefore requires no withholding period
- multiple follow up applications are possible throughout the growing period
- it leaves no harmful residue in the soil or plant after application
- it does not harm non-target organisms such as the honeybee, earthworm and beneficial soil fungi and enzymes such as Trichoderma and Catalase respectively
- it can be applied through various systems

Using Crop Guard in a Smart Farming operation gives you the ability to optimise your crop yield while maintaining soil health and fertility. It enables you to improve and sustain the condition of your soils, now and into the future.

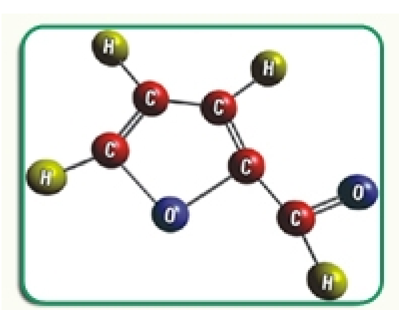
PRODUCT OVERVIEW

General name: Furfural

Formula: $C_5 H_4 O_2$

Formulation: Emulsifiable concentrate

Chemical class: Aldehydes



CHARACTERISTICS

BEHAVIOUR IN SOIL

- Rapid breakdown
- Leaves no harmful residue
- Not temperature sensitive
- Not pH sensitive

METHOD OF KILLING

NEMATODE EXPOSURE TO FURFURAL

- Nematodes do not have a respiratory or circulatory system.
- The cuticle, with the outermost layer of lipids, serves as a barrier between the delicate internal chemical balance and the surrounding environment.
- The lateral striae and annules are ornamentation organs which function to compensate for stress factors or aid in movement of a normal nematode. Should any part of the cuticle therefore be damaged in any way, the internal balance or movement will be disturbed with fatal consequences for the nematode.
- Nematodes exposed to low concentrations of furfural in water were so damaged by the furfural that no annules could be seen, and the striae were swollen beyond repair. Even if these nematodes did survive the Crop Guard, they would not be able to move.

MODE OF ACTION

- Via direct exposure of the nematode to the active ingredient
- Reacts directly with the cuticle of the nematode
- Low concentrations damage the cuticle of the nematode
- Secondary effects immobilize and kill the nematode

MOVEMENT IN SOIL

SOIL TYPES

- The proportions of sand, silt and clay particles determine soil texture, which can be broadly categorised into three main types i.e. sand, loam and clay soil.

- The following definitions can be used to classify each general soil type.

  - **sand** : soil material that contains 85% or more of sand: 0-10% clay and 0-15% silt. The sum of clay and silt should not exceed 15%.
  - **loam** : Soil material that contains 7 to 27% clay, 28 to 50% silt, and <52% sand.
  - **clay** : Soil material that contains 40% or more clay, <45% sand, and <40% silt.

LEACHING INDEX

The leaching index is an indication of the ability of a pesticide to infiltrate ground water. A pesticide with an index of 10 or less has a low filtration potential. If the index is 2000 or greater the pesticide has a high filtration potential. Crop Guard has a low filtration potential and therefore poses no threat to groundwater.

IRRIGATION

Irrigation water is one of the primary and most effective methods used to move Crop Guard into the zone that needs protection. Studies have shown that Crop Guard moves downward and laterally with the irrigation profile in soil.

The amount of irrigation water is dependant mainly on:-

- Soil texture
- Soil moisture at the time of application
- Depth of soil that we aim to protect

SAND AND LOAM SOILS

For fields irrigated to field capacity the table below can be used as guide to determine the amount of irrigation water, in millimeters, required to move Crop Guard to the desired depth in sand and loam soils.

SOIL TEXTURE	RATIO (mm Water: Depth)
SAND	1.0mm : 1cm
LOAM	1.5mm : 1cm

HEAVIER / CLAY SOILS

For clay soil, field capacity conditions are not recommended. Due to its high water holding capacity and very low infiltration rate it results in run off when the product is applied. To obtain movement of the product to the desired depth, the rate of irrigation must be slower and over a longer period of time. This is ideally achieved via a drip irrigation system at the ratio recommended in the table below.

SOIL TEXTURE	RATIO (mm Water: Depth)
CLAY	2.0mm : 1cm

CHARACTERISATION OF SOIL IN THE FIELD

In the field, soil texture can be easily determined by observing the behaviour of a handful of moist soil, kneaded into a ball. The table below describes how the three basic soil types can be determined using this method.

SOIL TEXTURE	BEHAVIOUR OF SOIL BALL	RIBBON
SAND	Forms a very weak ball.	Ribbon will not form.
LOAM	Firm ball forms. Smooth and spongy feel.	Short ribbon forms < 2.5cm
CLAY	Ball very firm, feels sticky, plastic-like.	Long ribbon forms > 2.5cm

TOXICOLOGY

NATURAL OCCURRANCE OF FURFURAL

Furfural is formed from the acid hydrolysis of polysaccharides, which contain pentose. Furfural has been detected in a broad range of fruit, fruit juices, wines, coffee and tea.

Examples of the natural occurrence of Furfural in food:

Coffee and cocoa	255ppm
Alcoholic beverages	33ppm
Wholegrain bread	26ppm

TOXICOLOGY TO EARTHWORM AND HONEYBEE

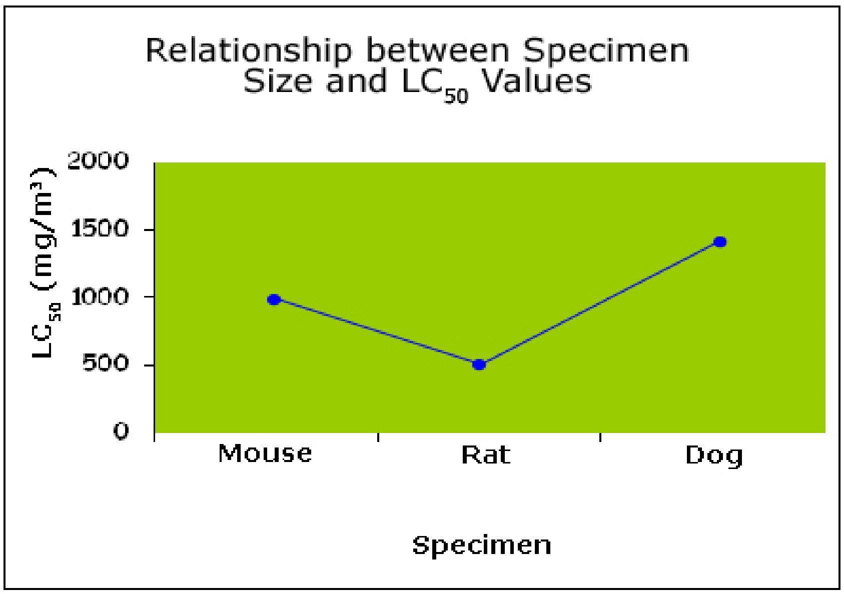
Furfural has been classified as non-toxic to both the earthworm and honeybee according to:

Study	Results	Classification
Acute tox - earthworm	LC_{50} - 406.18mg/kg	Non toxic to earthworm

Acute oral - honeybee	LD_{50} >100µg/bee	Non toxic to honeybee
Acute contact - honeybee	LD_{50} >81µg/bee	Non toxic to honeybee

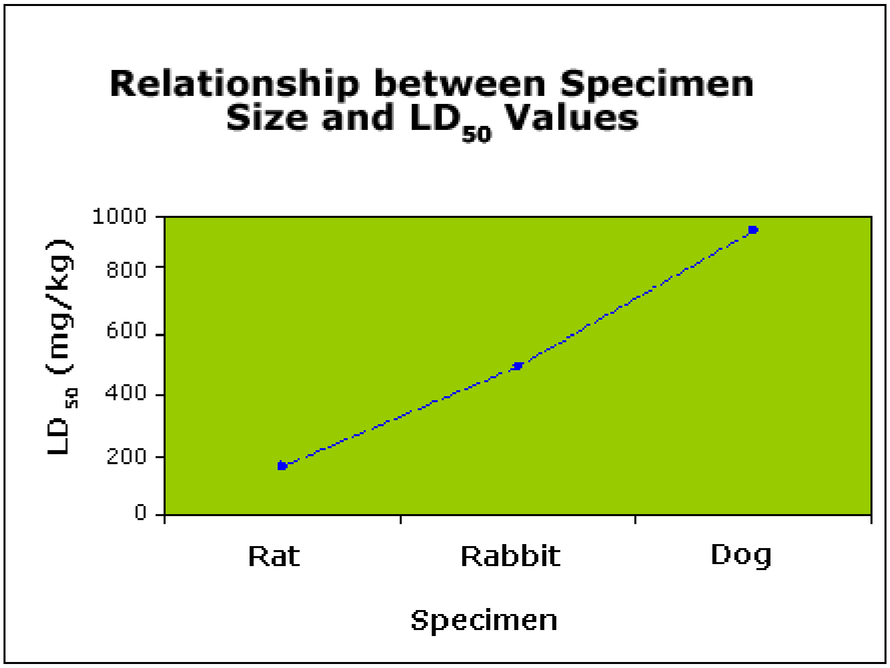
TOXICOLOGY OF FURFURAL

LC_{50} is the lethal concentration of that quantity of a substance administered by inhalation that is necessary to kill 50% of test animals exposed to it within a specified time.



TOXICOLOGY OF FURFURAL

LD_{50} is the lethal dose of that quantity of substance administered orally that is needed to kill 50% of animals exposed to it within a specific time.



CROP LABELS

Click below to download the English version of the labels in PDF format:

- Full version
- Tomatoes
- Maize
- Onions
- Sugarcane
- Carrots
- Chillies, Peppers, Paprika

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