



**KULICIDE**

A new non-toxic chemical combination  
to fight and destroy Mosquito Larvae

**100% KILL IN UNDER AN HOUR-SAFELY**





# Why Kulicide is the only solution to larval control

**Kulicide is effective, whilst being green, environmentally safe and non-toxic. It acts on the mosquito larvae before they hatch, which is preferable to trying to kill free-flying hatched mosquitoes. Mosquito larvae are protected by an oil cocoon - and many larvicides cannot penetrate this cocoon. Those that can, are toxic to the water and aquatic environment.**

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## The mosquito problem

Mosquito larvae live in water until they pupate and develop into adult mosquitoes. Mosquito larvae are protected in an oily sack called a cocoon, which is difficult to break down.

Mosquitoes prefer stagnant water within which to lay their eggs. They most commonly infest ponds, marshes, swamps and other wetland habitats. However, they are capable of thriving in a variety of locations and can successfully grow in numbers even when not in their natural habitat. Many species of mosquitoes use containers of water as egg-deposit sites.

Hot, humid environments are most amenable to mosquito growth and survival. Infestations can occur easily in tropical areas. Some species have also been known to inhabit freezing locations such as the Arctic Circle.

Mosquito larvae can be found in various habitats. Some larvae are active in transient waters such as floodwater, ditches and woodland pools. The Anopheles, Culex, Culiseta, Coquillettidia and Uranotaenia species breed in permanent bodies of water and can survive in polluted water as well as freshwater, acid water and brackish water swamps.

Other mosquito larvae may be present in container water sources such as puddles, upon leaves and in stagnant water within small pools.



The larvae of most species use siphon tubes for respiration; however, some larvae cling to plants to access air supplies. Mosquito larvae consume microorganisms and organic matter in water.

Mosquito larvae may be as large as about 5 mm and can be clearly visible in water.

Larger larvae are located closer to the water's surface. Mosquito larvae are extremely sensitive and will submerge for protection if they sense disturbance.

Mosquito control involves the elimination of existing infestations and the prevention of re-infestation through the eradication of larval populations. In order to control mosquito larvae, regular inspections of possible breeding sites must be conducted.

Because mosquito larvae cannot survive away from water, areas affected by an infestation should be combed for water sources. Water that has been stagnant for three days is a prime habitat for mosquitoes. Some species require minimal amounts of water to thrive; even water sources such as birdbaths are potential breeding sites.

## The risk - Malaria kills people

- About 3.3 billion people – approximately half of the world's population – are at risk of malaria. In 2010, there were about 219 million malaria cases (with an uncertainty range of 154 million to 289 million) and an estimated 660 000 malaria deaths (with an uncertainty range of 490 000 to 836 000)
- Every minute, a child dies from malaria
- Malaria causes significant economic losses in high-burden countries
- In high-burden settings, malaria can trap families and communities in a downward spiral of poverty, disproportionately affecting marginalized and poor people who cannot afford treatment or who have limited access to health care

## The risk - Dengue fever kills people

A dengue epidemic is raging in Central America, and Asia. The Pan American Health Organisation fears the figures may “explode”, with this year looking “unusually bad”. With heavy rainfall and torrid heat, conditions are particularly favourable for proliferation of the main vector of dengue fever, the *Aedes aegypti* mosquito, whose eggs hatch on the surface of ponds. In 2010 the World Health Organisation reported 1.6 million cases of dengue fever in Latin America alone, of which 49,000 were severe, a leading cause of death among children in the region. The Philippines is also in the grip of a dengue epidemic, as is Pakistan – to name a few of the affected areas.

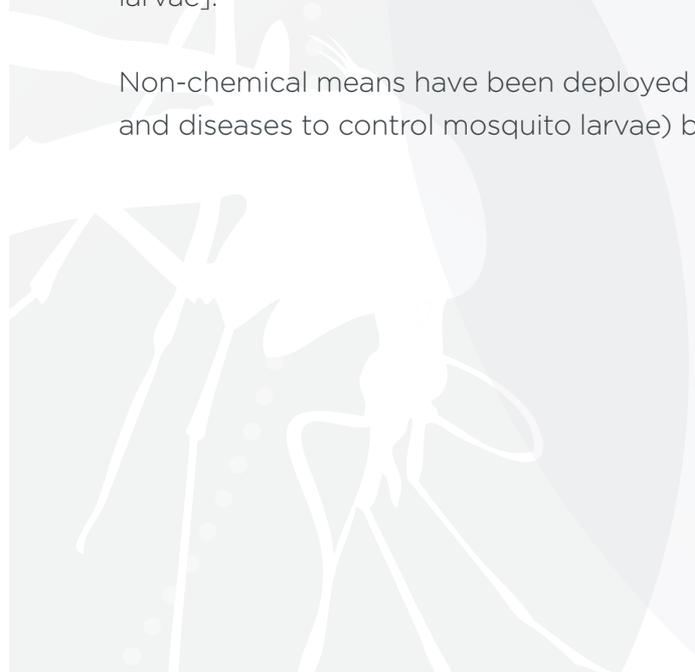
## Current mosquito control

Mosquito control can be divided into two areas of responsibility: individual and public. Most often it's performed following the Integrated Mosquito Management (IMM) concept.

Public control methods are performed following the Integrated Mosquito Management (IMM) concept. IMM is based on ecological, economic and social criteria and integrates multidisciplinary methodologies into pest management strategies that are practical and effective to protect public health and the environment and improve the quality of life.

IMM strategies are employed in concert with insecticide. These include source reduction, which incorporates physical control (digging ditches and ponds in the target marsh) and biological control [placing live mosquito eating fish (*Gambusia*) in the ditches and ponds to eat mosquito larvae].

Non-chemical means have been deployed (examples include invertebrate predators, parasites and diseases to control mosquito larvae) but are harder to verify.





## **Kulicide is completely compatible with an IMM approach to mosquito management**

### **Larvicide option**

If one acre of larval habitat is treated, the local mosquito population can be completely eliminated.

### **Adulticide option**

If 500 acres of land is fogged, 85 to 90% mosquitoes at best would have been eliminated at the cost of environmental effects.

**The Larvicide option is always better than the Adulticide option. Kulicide is an outstanding Larvicide.**

## **The best of the best in Larvicides - Insect Growth Regulators (IGR)**

- There are different types of larvicides which work at different stages of the larval growth
- Insect Growth Regulators (IGR's) are a type of larvicide that prevent insects and related organisms from completing their development to adults
- Use of IGRs ensures complete eradication of mosquito growth

**Kulicide is an Insect Growth Regulator**



## Optimal IGR mechanism – Chitin synthesis inhibitor

Chitin synthesis inhibitors work by preventing the formation of chitin, a carbohydrate needed to form the insect's exoskeleton.

- The inhibitors prevent the new exoskeleton from forming properly, causing the insect to die
- Death may be quick, or take up to several days depending on the insect
- Chitin synthesis inhibitors can also kill eggs by disrupting normal embryonic development
- Chitin synthesis inhibitors affect insects for longer periods of time than hormonal IGRs
- These are also quicker acting

**Kulicide is a Chitin synthesis inhibitor**

## Comparison of our solution to current WHO approved chemicals

Competitor Product	USP	Gap
Gentrol (Hydropene)	IGR for all the pests	Causes pneumonia when inhaled, has to treated in isolation condition, toxic to fish and aquatic invertebrates
Gentrol (aerosol ready to use)		
Archer IGR (Pyriproxifine)		
NyGuard IGR (Pyriproxifine)		
Precor IGR concentrate (Methoprene)		
Metero IGR concentrate (Methoprene)		
Nylar IGR (substituted Ethoxy Pyridine)		
Distance IGR (Pyriproxifen)		
Preclude TR (Phenoxy Carb)		
Pivot 10 IGR (Pyriproxifen)		
Azatin XL (Azadirachtin - Neem)	Many mosquito species developed resistance	This pesticide is toxic to fish and aquatic invertebrates. Need to spray under isolated conditions with protective clothing
Bti (Bacillus based product)	Non toxic	Host specific
<b>Kulicide</b>	<b>Non toxic, IGR for all pests</b>	<b>Residual effect is less than the synthetic products, which is understood characteristic of green and herbal products. Organic and safe for fish and birds.</b>



## Comparison of our solution to current WHO approved chemicals

We have benchmarked the Kulicide product against leading WHO approved chemicals both from an efficacy and commercial standpoint

Excellent performance can be achieved in a cost competitive manner, with the additional beneficial safety profile of Kulicide.

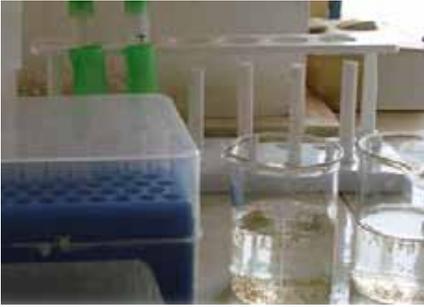
### Test results

Formulation result	Effect within 1hrs	Effect within 2hrs	Effect within 3hrs	Remark
Kulicide	Effect started in 8 minutes, within 30 minutes all larvae settled at bottom, suffocated and very critical condition.	100% larvae dead	100% larvae dead	Excellent effect. No residual problems, no harm to fish, birds or plants.



## Efficacy of the product

(Maximum concentration required for minimum time of kill - 890 ppm)



Larva post treatment -  
tested in Neat and  
polluted waters

Mosquito Larva tested	Time taken for 50% of the larva to die	Time taken for 90% of the larva to die	Time taken for 99% of the larva to die
Aedes	30 min	60 min	2 hrs
Anopheles	32 min	73 min	2 hrs
Culex	18 min	54 min	2 hrs

## Bio efficacy - after 24 hrs

(Lab reared larvae) - MIC

Mosquito Larva tested	LC <sub>50</sub>	LC <sub>99</sub>
Aedes	4 ppm	74 ppm
Anopheles	8 ppm	96 ppm
Culex	5 ppm	61 ppm



## Effective IMM and Kulicide

It has been found that spraying oil based insect repellents alone on water bodies is not effective as the larvae are able to survive even in these conditions.

### Our formulation however is unique

- It is a \*Green product\* with no hazardous side effects on humans and environment
- Useful both as a Larvicide and an Adulticide, it effects all the stages of the life cycle of the mosquitoes, Larva, Pupa and Adult Mosquito
- Effective against a wide range of mosquito species equally
- Effective in very low dosages
- Cost Efficient compared to most of the existing products in market
- Ease of use (single formulation for both larvae and adult mosquitoes)

### EASY APPLICATION, NO RESIDUAL EFFECTS



## Larval control with Kulicide

The ideal regime to incorporate Kulicide is larviciding. Thus Kulicide will be targeted at the immature mosquitoes - the larvae or pupae.

Kulicide will be applied to bodies of water harbouring the larvae. However, since larvae do not usually occupy the entire body of water, Kulicide will be applied where the larvae are, usually the areas near the shoreline of the lake, stream or ditch.

This is a highly effective use of Kulicide because it is directed at a limited, targeted area where the larvae grow and mature.

## Why is Kulicide the only solution to total larval control

- Lab and field proven ability
- Non toxic-Natural safe product
- Unique blend of chemicals
- Green Formulation for most effective larvae control
- 100% kill at all stages of larvae for nil adult mosquito development
- Cost efficient - prices on a par with WHO approved products, which can be toxic, and which do not work efficiently or at all
- Game changer in the prevention of Malaria and potentially saving millions of lives
- Available for immediate deployment



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