Temephos / Larvicide

TEMPO - INTRODUCTION

Mosquitoes are worldwide in distribution. No collection of water, whether fresh, saline, or foul, occurs without some mosquito utilizing part of it. Water is essential for mosquitoes to develop. Broad acreage of poorly drained land, tidal marshes, river floodplain and the ponded area of prairies and plains are all capable of producing great population.

Mosquitoes have a pronounced effect on human health and welfare. Aside from the discomfort and irritation caused by the bite itself, mosquitoes are the vectors of malaria, yellow fever, dengue, filariasis and encephalitis, five of the most dreaded diseases in the world today. Fortunately, all but one of these has been eradicated in Canada. But, a very real and present danger in our country is encephalitis. Regrettably, however, in tropical and sub-tropical countries, malaria, yellow fever, and dengue are still important threats to health.

The main weapon used to control epidemics of these diseases is:

- Mosquito control to prevent the spread of the disease.
- Medicine to prevent and/or cure the disease in humans.

The development stages in the mosquito's life cycle are egg, larva, pupa and adult. Eggs may be deposited singly on the surface of the water, singly on the sides of containers, tree holes, or on the ground, or they may be deposited in rafts on the water. Species which deposit floating eggs (Anopheles, Culex) hibernate as adults, while those that deposit eggs that sink (Aedes) hibernate as eggs. The eggs usually hatch within 2 or 3 days or oviposition, in the case of Anopeles and Culex or within a few days after being flooded as is typical of the genus Aedes.

The larvae of all mosquitoes live in water. They are adapted to almost all aquatic situations. The larvae develop through 4 instars in a period of 4 to 10 days. At the end of the fourth instar, the larva molts and a pupa develops. The pupae also live in water and generally must come to the surface for air. Pupa development may be completed in some species in a single day, but the usual time period involved is several days. At the end of the pupae stage, the pupae skin splits along the dorsal surface and the adult works its way out, crawls onto the surface of the water and flies away.

Ordinarily, the males emerge first and remain near the breeding sites, mating with the females soon after they re-emerge. Some species, such as (Aedes Aegypti), breed only in and around human dwellings and fly only short distances. The life span of adult mosquitoes is extremely variable, from a maximum of 1 or 2 months for some species and up to 6 months or more for those species that hibernate as adults.

SURVEY AND CONTROL

Surveys are essential for the planning operation and evaluation of any effective mosquito control program, whether it is for the prevention of mosquito-borne diseases, or the reduction of the nuisance effect of biting mosquitoes in the community. Surveys are used to determine the species of mosquitoes present in an area, their relative abundance and the source of their development. Such studies are conducted for both adult and larvae population.

An abatement program usually involves physical, biological and chemical control. Physical control, or source reduction, means modifying or removing larvae breeding sites. This includes filling or draining breeding sites and properly maintaining water levels and irrigation systems. Biological control uses natural enemies, e.g., predators and parasites, to reduce mosquito populations. Biological control agents include fish, (Gambusia affinis) guppies and other small fish which are predators. Chemical control can be used on

both larvae and adults. Most chemicals give the advantage of immediate control. They succeed where physical and biological control measures may have failed; in fact, there is no alternative to chemical control when rapid elimination of disease carrying mosquitoes is necessary to prevent epidemics. Chemicom Inc. has developed TEMPO INSECTICIDE and LARVICIDE for controlling mosquito larvae. When used at recommended rates, TEMPO is an effective insecticide with low hazard to man and animals. TEMPO is formulated in several ways to fit various methods of application. An integrated pest management program using physical biological and chemical control methods provides maximum mosquito control.

TEMPO INSECTICIDE

Larviciding is the first step in chemical mosquito control since the mosquitoes are killed at the breeding site, prior to dispersing and infesting a community. TEMPO insecticide was first used as an emulsifiable concentrate for the control of the mosquito larvae. Since that time several granular formulations have been developed.

The different formulations of TEMPO were developed to accommodate various conditions and equipment used in mosquito abatement programs. Emulsifiable concentrates are designed for use in spray applications when there is unobstructed access to the breeding site. In cases where vegetation around the breeding area is dense, TEMPO granular formulations are used to penetrate the target site. The results of laboratory and field studies show that TEMPO is highly effective against most species of mosquito larvae tested.

TOXICITY

The toxicological effects of TEMPO and its metabolites have been extensively studied. Numerous acute and long-term chronic toxicity studies have been conducted to evaluate effects on birds, fish and mammals. Several of these investigations are presented below to demonstate the low effects on TEMPO on non-target organisms.

After many years of field use throughout the United States, no detrimental effects on birds have been reported from application at the recommended rates. No deaths in either rats or dogs were observed following 90 days feeding studies at levels of 350 ppm and 500 ppm, respectively. In a 19-month test in Puerto Rico, Cyanamid Abate (equivalent to TEMPO) was added to the drums and cisterns in which a community of about 2,000 persons stored its drinking water. There was no accumulation of TEMEPHOS in the water, despite monthly additions of the insecticide. With minor exception, the residents readily accepted this use of TEMEPHOS. Careful surveillance failed to reveal any illness or significant side effects attributable to this control measure.

Numerous investigations conducted both in laboratories and under actual field use show TEMEPHOS to be one of the least hazardous larvicides developed to date. Although TEMEPHOS is a cholinesterase inhibitor, it is far less active than many other insecticides in this class. As with all cholinesterase inhibitors, excess absorption of the compound into the body causes a reduction of cholinesterase activity in blood and nervous tissue, which may progress to symptoms of intense parasympathetic stimulation. If the source of contamination is removed, the attack is of short duration and complete recovery usually occurs within several hours. Unless there has been a complete lack of care in handling, or a gross disregard of personal cleanliness, users will not incur any illness in applying TEMPO.

The higher the LD50 the less toxic the insecticide. Thus, TEMPO is less toxic than most widely used insecticides and presents low hazard to humans and animals.

FORMULATION

Chemicom Inc. manufactures a variety of formulations of TEMPO brand TEMEPHOS. We manufacture several liquid emulsifiable formulations of roughly 50%. Namely,

- TEMPO 4E (4lbs/US gallon)
- TEMPO 500 E (500 grams/kg)
- TEMPO 50EC (500 grams/litre)
- TEMPO GRANULAR
- TEMPO SACHETS (20 gr)

TEMPO 4E is the formulation registered in the U.S.A., while the WHO specifies 500 E and, 50EC is preferred in Europe.

GRANULAR FORMULATIONS are formulated at 1%, 2% and 5% levels. TEMPO 1-G (1%) formulated on a special sand granule of density around 90 pounds per cubic feet. TEMPO 2-G is formulated on a Celatom granule of around 25 pounds per cubic feet.

The 1% formulation is also available in 20gr. Sachets, used for application in water tanks, and reservoirs, where rain water may accumulate such as in playgrounds, garden pots, ceramic vases, old tires. The choice of carrier is based on the type of application equipment available, the type of water (potable or not potable), the type of larvae (surface or submerged), and whether or not the body of water is covered by a canopy of vegetation. For applications in potable water, it is desirable for the granular carrier to sink to the bottom rapidly to avoid water clouding. Further, the 1-G formulation is superior in penetrating vegetation canopies. This formulation is specified by the WHO (World Health Organization Specification WHO/SIF/40.R1).