ALTOSID® LIQUID LARVICIDE USER'S GUIDE FOR POWER MIST SPRAYERS



Altosid[®] Liquid Larvicides are effective and flexible mosquito larvicides that contain our pioneering insect growth regulator (S)-methoprene as their active ingredient. (S)-Methoprene disrupts the normal growth cycle of immature mosquitoes and prevents them from emerging as breeding, biting adults that can spread disease. Altosid[®] products are environmentally sound and will not adversely affect humans, fish, waterfowl, mammals or beneficial insects, so public health professionals can feel comfortable using them in sensitive areas.

URBAN AND RURAL MOSQUITO HABITATS

Mosquito species with the potential to carry and spread diseases such as West Nile virus, dengue fever, Zika virus, yellow fever, malaria and chikungunya can be found in both urban and rural environments. Habitats can range from containers and pools in backyard urban settings to large pastures, marshes, drainage areas and ditches in rural areas. Standing water in almost any environment has the potential to be a source of mosquitoes. As such, different habitats and different mosquito species often need different larval control strategies. Altosid[®] Liquid Larvicides offer superior larval mosquito control in a wide range of habitats and application areas, including the often difficult to find and access sites that breed *Aedes aegypti* and *Aedes albopictus* species – primary vectors of dengue fever, Zika virus, yellow fever and chikungunya.

WIDE AREA LARVICIDE APPLICATIONS

The use of power mist sprayers, typically mounted to vehicles or trailers, has gained popularity in recent years as a means of controlling larval mosquito populations over large areas in both urban and rural environments. The technique has become particularly effective at controlling container-breeding mosquito species in urban settings, where cryptic habitats are often difficult to find and access. During these applications, powerful sprayers are carefully calibrated to generate a mist of droplets within a specific size range that carry throughout the intended treatment area and deposit in these difficult-to-reach sources. Wide area applications of Altosid[®] Liquid Larvicides are also effective in large rural mosquito habitats, where timing and the use of downwind airflow allow for the treatment of swath widths of up to 300 feet.

GETTING STARTED

Altosid[®] Liquid Larvicides provide superior larval mosquito control when applied through power mist sprayers. They are easy to mix, easy on equipment and easy to clean up, making them an ideal choice for public health professionals who need to maximize both efficacy and efficiency. Altosid[®] Liquid Larvicides come in two formulations, Altosid[®] Liquid Larvicide Mosquito Growth Regulator (SR-5) and Altosid[®] Liquid Larvicide Concentrate (SR-20), both of which are labeled for aerial and ground ULV and fine mist applications in urban and rural habitats.

POWER MIST SPRAYERS

There are several brands of power mist sprayers on the market and the specific equipment manufacturer's operational instructions should be followed when calibrating and making applications. Mist sprayers capable of producing droplets in the extremely fine to fine (EF/VF/F) size classification range (ASABE S572.1 Standard) should be used for these wide-area applications. The type of nozzle on the mist sprayer is important to achieving the desired results in these applications and we recommend that Micronair® nozzles with EX6353 short fan blades be installed on the sprayer and set at a 55° pitch angle for best results.

When choosing a mist sprayer, consider the specific requirements of the individual mosquito control program. Equipment must be capable of generating the desired droplet size and flow rate for local use patterns and conditions. The mist sprayer should be capable of producing flow rates sufficient for coverage of swaths up to 300 feet at vehicle speeds of 5 to 10 mph. Equipment models must be selected based on capacity and tested locally with mixed product in order to achieve the desired results.

APPLICATION RATE AND VOLUME

Altosid[®] Liquid Larvicide Mosquito Growth Regulator (SR-5) should be applied at a rate of 4 fl oz per acre, and Altosid[®] Liquid Larvicide Concentrate (SR-20) should be applied at a rate of 1 fl oz per acre. Both formulations should be mixed with sufficient water to provide complete coverage of the treatment area, typically 0.5–5 gallons of total spray solution volume per acre.

For initial wide area applications of Altosid[®] Liquid Larvicides, a starting spray volume of 0.5 gallon per acre (GPA) is recommended and will be used in the following examples and calculations. As power mist sprayer equipment varies, finished spray volume and mix ratio can be adjusted as necessary to achieve the desired coverage and droplet density at the labeled application rates.



SPRAYER CALIBRATION

- 1. Calibrate equipment to desired droplet size according to equipment manufacturer's instructions and note flow rates in floz per minute.
 - Because factors such as equipment capacity, obstruction height and density (buildings, trees, fences, etc.), distance between drivable roadways, and weather impact the desired droplet size needed to maximize the deposition within the treatment area, there is no one-size-fits-all droplet size for every circumstance. Central Life Sciences recommends starting with droplets that have a volume median diameter (VMD) of between 60-100 microns and 90% of the droplets should be smaller than 200 microns. Adjust accordingly to suit each specific situation and treatment area.
- 2. Determine swath width using appropriate methods or guidance from equipment manufacturers (typically, 200-300 feet). These methods include larval bioassay, water sensitive cards, spinning slides and equipment manuals.
- 3. Determine the desired application speed (typically, 5-10 mph).
- 4. Calculate acres treated per hour using the following formula:
 - MPH x 5,280 ft (1 mile) x swath width ft ÷ 43,560 sq ft (1 acre) = acres/hour
- 5. Calculate fl oz of spray per acre:
 - 60 minutes x fl oz per minute = fl oz per hour ÷ acres/hour = fl oz per acre
- 6. Add Altosid[®] Liquid Larvicide per calculated fl oz per acre to achieve label rate coverage.
 - Fl oz formulation tank ÷ fl oz per acre = acres per tank

EXAMPLE

A flow rate of 384 fl oz per minute (3 GPM) achieved desired droplet size and densities through selected equipment. Swath width was determined to be 300 ft with a selected 10 MPH application speed through urban areas using a 100-gallon formulation tank.

- 10 MPH x 5,280 ft x 300 ft swath ÷ 43,560 sq ft per acre = 364 acres/hour
- 60 minutes x 384 fl oz/minute = 23,040 fl oz/hour ÷ 364 acres/hour = 63 fl oz per acre
- Dilute one fl oz of Altosid[®] Liquid Larvicide Concentrate (SR-20) into every 62 fl oz of water to achieve the 1 fl oz per acre label rate coverage
- The formulation tank holds 100 gallons (12,800 fl oz), which provides 203 acres of coverage (12,800 fl oz ÷ 63 fl oz per acre = 203 acres coverage per tank)
- Fill tank 1/4 full with water, add 203 fl oz of Altosid[®] Liquid Larvicide Concentrate (SR-20) to tank, fill to capacity with water, agitate sufficiently and apply.

Note: If the desired application rate, swath width and vehicle speed are already known, the necessary flow rate can be calculated using this formula:

		GPM	=	Flow rate of equipment in gallons per minute	
GPM =	GPA x Speed x Swath 495	GPA	=	Application rate in gallons per acre (mixed product solution)	
		Speed	=	Forward speed in miles per hour (mph)	
		Swath	=	Swath width in feet (as determined during droplet characterization)	

The following table illustrates the application rate and flow rate for Altosid[®] Liquid Larvicide applications diluted and applied at 63 fl oz per acre at typical speeds and swath widths:

	Application Rate (High/Low)	Speed (mph)	Swath (ft)	Flow Rate (gal/min)
	High	5	100	0.5
	High	5	200	1
 High application rate = 0.32% solution 1 fl oz Altosid[®] Liquid SB-20 to every 62 fl oz water 	High	5	300	1.5
 4 fl oz Altosid[®] Liquid SR-5 to every 59 fl oz water 	High	10	100	1
	High	10	200	2
	High	10	300	3
	Low	5	100	0.25
Low application rate = 0.24% solution	Low	5	200	0.5
• 0.75 fl oz Altosid [®] Liquid SR-20	Low	5	300	0.76
 3 fl oz Altosid[®] Liquid SR-5 to every 60 fl oz water 	Low	10	100	0.5
	Low	10	200	1
	Low	10	300	1.5

EVALUATING EFFICACY OF WIDE AREA LIQUID LARVICIDING

Due to the cryptic biology of container breeding mosquitoes, a multi-pronged approach to measuring efficacy should be employed in treatment and control areas. The effects of Altosid[®] Liquid Larvicides should be quantified to evaluate the treatments and their effect on mosquito populations over time.

Use as many methods as feasible to determine efficacy, establish treatment intervals, and evaluate the inhibition of emergence within treated mosquito populations. Monitoring should begin as early as possible and be maintained well after control efforts conclude so treatment programs and application intervals can be tailored to achieve the best results. Initially we recommend treating biweekly. To evaluate the effectiveness of an application, there are a few methods that may be utilized.

DIRECT TREATMENT EVALUATION

Pupae Sampling

Pre-treatment larval and pupal abundance should be recorded at treatment or experimental/control sites if relevant. The sampling method (e.g. dipping) should be appropriate to the type of breeding habitat, and the appropriate number of samples should be taken from each habitat based on the type and size of the habitat. Larval instars and pupae from each sample are counted and recorded.

It is important to wait at least 48 hours prior to field validation of treated sites as this period of time allows the mode of action of (S)-methoprene to be effective as an insect growth regulator. At 48 hours post-treatment, record larval abundance (all stages) and collect pupae (e.g. 20-40 per replicate) to be brought back to the laboratory. Collected pupae will be held in the laboratory and will be monitored to determine inhibition of adult emergence. Dead pupae should be removed from cups and any morphological abnormalities noted.

Do NOT collect larvae from the field (see following note for more detail)

Note: Collecting larvae is *not* an effective method for determining inhibition of adult emergence. Mosquito larvae must remain in a treated environment upon molting to pupae. In addition, larvae and water brought back from the treatment sites will lose (S)-methoprene over time, which could result in degradation of active ingredient and not fully inhibit emergence.

Inhibition of emergence as a percentage (IE%) is calculated using the following formula:

$$\mathsf{IE}(\%) = \left(\frac{\mathsf{C}\text{-}\mathsf{T}}{\mathsf{C}}\right) \mathsf{X} \mathsf{100}$$

where C = percentage of survival or emergence from control samples and T = percentage survival or emergence from treated samples.

Characterization of treated sites and habitats in terms of abiotic and biotic factors aids the interpretation of results. Rainfall and any change in water level or other parameters, such as algal bloom, water quality, outflow, temperature and predators in the habitats should be recorded and taken into consideration.

INDIRECT TREATMENT EVALUATION METHODS

Adult Mosquito Trapping

Select sites inside treatment and control areas to monitor adult mosquito populations before and after treatment using appropriate traps. Begin monitoring adults in central areas of selected sites as far ahead of treatments as possible. To minimize trapping mosquitoes that may migrate from areas outside the test blocks, locate trapping sites well inside test areas. Consider the primary ecology and behavior of target mosquito species and/or those species of public health importance in trapping efforts.

Ovitraps

Locate appropriate numbers of ovitraps inside test blocks and monitor weekly to establish a baseline. Ovitraps are a relatively good tool for measuring a population of container-breeding mosquito species' reproductive capacity after treatments. Recording the number of eggs produced in treatments vs controls will measure the fitness of the populations during control programs.

Use as many methods of evaluation as feasible. When possible, minimize the impact of mosquitoes migrating into monitoring areas with optimal trap placement and timing. The habits of container-breeding mosquitoes can be cryptic and unpredictable, so attentive monitoring of various population measures and their potential is key to successful control efforts.

Once local conditions have been evaluated and control measures determined, combine Altosid[®] Liquid Larvicide applications with other control strategies, if required, to achieve the desired level of mosquito population reduction. Inspections, community education and outreach, and continual surveillance of mosquito populations are keys to successful long-term control.

ALTOSID[®] LIQUID LARVICIDE FEATURES

- Prevents the emergence of adult mosquitoes, including those that may transmit diseases such as West Nile virus, Zika virus, dengue fever and chikungunya
- Kills pupating larvae
- Mimics insect juvenile hormone to disrupt metamorphosis
- The (S)-methoprene in Altosid® formulations has been used effectively in professional mosquito control for 40 years with an excellent environmental footprint
- · Easy to mix, easy on equipment and easy to clean up

- Low use rates allow "economic" dilutions to match
 application equipment and limited budgets
- Effective in aerial and ground ULV and fine mist applications in rural and urban areas and habitats for control of container-breeding mosquitoes
- Water dilutable diluted mix can be stored for 48 hours in application equipment
- Effective in large-area rural applications, where
 timing and the use of downwind airflow allow for
 the treatment of swath widths of up to 300 feet



THIS IS MOSQUITO CONTROL EVOLVED

At Central Life Sciences, we're staying ahead of the insects of the future by harnessing the power of innovation.



Scan the QR code to learn more about the Altosid[®] product family from Central Life Sciences.



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