

MOSQUITO CONTROL
PRODUCTS WORKSHOP
JANUARY 21, 2025



2025 CALENDAR

January-2025						
SUN	MON	TUES	WED	THUR	FRI	SAT
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

March-2025						
SUN	MON	TUES	WED	THUR	FRI	SAT
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

May-2025						
SUN	MON	TUES	WED	THUR	FRI	SAT
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

July-2025						
SUN	MON	TUES	WED	THUR	FRI	SAT
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

September-2025						
SUN	MON	TUES	WED	THUR	FRI	SAT
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

November-2025						
SUN	MON	TUES	WED	THUR	FRI	SAT
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

February-2025						
SUN	MON	TUES	WED	THUR	FRI	SAT
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	

April-2025						
SUN	MON	TUES	WED	THUR	FRI	SAT
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

June-2025						
SUN	MON	TUES	WED	THUR	FRI	SAT
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

August-2025						
SUN	MON	TUES	WED	THUR	FRI	SAT
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

October-2025						
SUN	MON	TUES	WED	THUR	FRI	SAT
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

December-2025						
SUN	MON	TUES	WED	THUR	FRI	SAT
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

 Holidays

 Meetings

 Conferences

Mosquito Control Products Workshop

Florida Keys Mosquito Control District
Marathon Office
503 107th Street, Marathon, FL 33050

January 21, 2025
2:00 pm (approximate)

- 1. Call to Order**
- 2. Roll Call**
- 3. Approval of Agenda**
- 4. Purpose of the Workshop:** Chairman Goodman announces that the purpose of this workshop is to discuss the various mosquito control products used throughout the District.
 - a. *Bacillus thurengiensis israelensis*
 - b. *Bacillus sphaericus*
 - c. Spinosad
 - d. Methoprene
 - e. Larvicide oils
 - f. Pyrethroids
 - g. Organophosphates
- 5. Good of the Order**
- 6. Meeting Adjourned**



Mosquito Control Products used by the Florida Keys Mosquito Control District

Mikki Coss, Director of Operations

Stephanie Faucett, Research Biologist

Catherine Pruszynski, PhD, Research Biologist



Bacillus thuringiensis israelensis
(*Bti*)



Bacillus thuringiensis israelensis (Bti)

Target Stage:

Bti specifically targets mosquito larvae in their aquatic breeding sites.

Active Ingredient:

The active ingredient is a protein crystal produced by the *Bti* bacteria

Mode of Entry:

Mosquito larvae ingest the *Bti* crystals while feeding on the water surface where it's applied.

Gut disruption:

Once ingested, the *Bti* crystals are activated by the specific pH and enzymes in the mosquito larvae's gut, causing damage to the midgut lining.

Specificity:

Bti is considered highly specific to mosquito larvae, minimizing harm to other aquatic organisms. No non target effects



Fomulations used at the District



Vectobac G



Vectobac GS



Vectobac DT



VectoPrime



Vectobac WDG



FKMCD Delivery Methods





Bacillus sphaericus (Bs)



Bacillus sphaericus (Bs)

Target Stage:

mosquito larvae

Active Ingredient:

Bacillus sphaericus bacteria

Mode of Entry:

Mosquito larvae must ingest the *Bs* crystals for the toxin to activate.

Mode of Action:

Once ingested, the crystals are broken down by the larvae's gut enzymes, releasing a toxin that damages the midgut lining.

Bacterial spore involvement:

The toxin is produced by a bacterial spore, which is also ingested by the larvae.

Specificity:

Bs uses a bacterial strain (*Bsph*) that target different mosquito species from *Bti*. It is still highly specific to mosquito larvae and has been found safe for other aquatic organisms.





Vectolex FG



Vectolex WDG

Vectolex WSP





Spinosad



Spinosad

Target Stage:

Larvae

Active Ingredient:

Spinosad, a naturally derived compound from a soil bacterium.

Mode of Entry:

Ingestion and contact

Mode of Action:

Targets insect nicotinic acetylcholine receptors. Causes continuous nervous impulses, leading to paralysis and death.

Specificity:

Broad-spectrum, can affect other insects



Spinosad~Natular





Pyrethroids

Target stage:

Adults

Active Ingredients:

Permethrin- 30.0%

Piperonyl Butoxide* -30.0%

Mode of entry:

Contact

Mode of Action:

Pyrethroid pesticides are neurotoxins that kills insects by binding to sodium channels, which results in excitatory paralysis.

Specificity:

Broad-spectrum insecticide

Highly toxic to bees, toxic to aquatic invertebrates and fish



Pyrethroids

Application:

- Truck mounted ULV (ultra low volume) fogging equipment
 - Applied at speeds of 5 mph up to 15 mph with variable flow systems
- A 1 Mister for barrier treatments
 - 1 oz. of the formula to be mixed with a gallon of water can treat 1,000 sq/ft of area.
- Hand held fogger
 - ultra-low volume (ULV) application is effective at very low application rates



Pyrethroids



Larvicide Oil

Target stage:

Larvae/Pupae

Active Ingredients:

Mineral Oil- 97%

Mode of Action:

Kills by suffocation,
mosquitoes do not develop resistance

Specificity:

Aquatic organisms may be killed in waters where this product is used



Larvicide Oil

- **Application:**

- Handgun or hand-wand sprayer and by air. (*FKMCD only uses oils to hand treat an area)
- Applied by inspectors with 1 gal. BG Sprayer with wand or a 32 oz. spray bottle
- 7½ to 9 fl. oz. per 1000 sq. ft. or 2-4 teaspoons per 100 sq. ft. (10'x10' area) of water surface



Larvicide Oil

- **May be used in:**

- swamps
- marshes
- floodwater areas
- drainage areas
- storm sewer catch basins
- waste treatment facilities
- settling ponds
- ditches
- temporary rain pools
- abandoned swimming pools
- fountains
- ponds.

- Oils are registered with the EPA



Organophosphates:

Naled, Malathion, Dichlorvos



Organophosphates

Target stage:

Adults

Mode of entry:

Contact

Mode of Action:

Neurotoxin; Interferes with pathways in the nervous system (acetylcholinesterase inhibitor)

Specificity:

Broad-spectrum insecticide

Highly toxic to bees, toxic to aquatic invertebrates and fish



Organophosphates

- **NOT** the same as organo**chlorines** (DDT).
- Not persistent in environment, half-loss in sunlight is 30 min.
- Applied at ~1 oz./acre
- “Notify beekeepers of impending adulticide missions to mitigate non-target effects”.



Organophosphates



- Naled
- Used only in aircraft
- Used when *nuisance* or *vector* populations exceed thresholds



- Malathion
- Used in truck ULV and hand-held foggers
- Used when *nuisance* or *vector* populations exceed thresholds



- Dichlorvos
- Used in drains
- Long term product (lasts for 4 months)
- Special formulation creates a vapor



Methoprene



Methoprene

Target Stage:

Larvae

Mode of Entry:

Contact

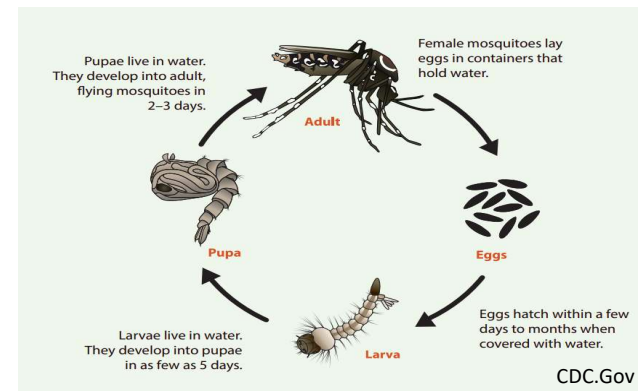
Mode of Action:

Juvenile hormone analog (JHA)

Pupae can't become adults if JHA is present. Pupae emerge malformed or not at all. No effect on adults.

Specificity:

Minimal risk to aquatic organisms including invertebrate immatures (dragon fly nymphs & Mysid shrimp)



Methoprene

- **Does not persist in soil or contaminate ground water**
 - **Degrades rapidly in sunlight**
 - **Metabolized rapidly in soil**
- **Extremely low potential for acute toxicity to humans from over exposure**
- **WHO approved it safe for drinking water**



Methoprene

- **Long term product**
 - 30 days for pellets
 - up to 150 days for XRs
- **Used in rotation with other larvicides**
- **Mostly containers, some field sites**



Sources:

[Adulticides | Mosquitoes | CDC](#)

[Malathion | US EPA](#)

[Methoprene General Fact Sheet](#)

[Naled for Mosquito Control | US EPA](#)

