

BEST MANAGEMENT PRACTICES

Mosquitoes

Background: Mosquitoes are one of the most common and important bloodsucking insects. The adult female mosquito feeds on the warm blood of mammals (including man) and birds and on the cold blood of fish, reptiles and amphibians. Mosquitoes are one of the most important public health pests due to vectoring of disease-causing pathogens. These mosquito-borne pathogens cause diseases like the West Nile virus, malaria, yellow fever, dengue and encephalitis. Worldwide these diseases afflict tens of millions of people per year and kill millions per year as well. In the US, West Nile Virus and encephalitis outbreaks occur frequently.

Description/Biology: Mosquitoes undergo a complete life cycle, which means they go through four stages: eggs, larvae, pupae, and adults. All mosquitoes complete their life-cycle in about 10 - 14 days in summer months. Female adult mosquitoes usually are the only ones that feed on blood. They have piercing-sucking mouthparts (needle with suction tube) from which to extract blood from a victim. For normal metabolic function, plant juices and nectar provide the required nutrients. A blood meal is required for egg development from which protein is extracted. It is during this feeding process that pathogens are introduced into victim's blood stream. Eggs are laid singularly or in tight clusters called rafts.

Many species of mosquitoes occur worldwide. *Culex*, *Aedes* and *Anopheles* are general genus groupings.

Common *Culex* species include *C. pipiens* (Northern House), *C. p. quinquefasciatus* and *C. tarsalis*. *Culex pipiens* and *C. p. quinquefasciatus* are plain brown and lay eggs in rafts in rain barrels, flower pots and any other water-holding vessel high in organic pollution. *C. tarsalis* is dark brown with white bands on legs and on proboscis and may lay eggs in clear water.

Common *Aedes* species include salt marsh species like *A. taeniorhynchus* (Black Salt Marsh), *A. sollicitans* and *A. dorsalis*. These species typically breed in salt water marshes along the coast. They lay eggs singularly on water or on mud surfaces. *Aedes* species also include the floodwater species that breed in riverine flood plains and in water seepage areas. *Aedes* species such as *Ae. sierrensis*, *Ae. triseriatus* and *Ae. aegypti* most often breed in water-filled tree hole cavities.

Common *Anopheles* species include *An. freeborni*, *An. quadrimaculatus*, *An. earlei*, *An. occidentalis* and *An. aztecus*. Eggs are laid in clean still water. *Anopheles quadrimaculatus* is common vector for malaria in USA. Life cycle in this species on average may take about 3 weeks to a month, and the egg stage is very prone to desiccation.

Management: Mosquito management involves very comprehensive treatment strategies including those established by public health authorities and mosquito abatement agencies. This BMP attempts to provide adult mosquito population management guidance around individual dwellings as part of a perimeter pest management program.

Inspection:

The inspection should focus on any current or future breeding sites. These sites include any item that may hold water sufficient enough to maintain life cycle development. These items may include old tires, flowerpots, garbage cans, poorly drained gutters, toys, poor grade slope or soil depressions, tree holes/cavities, bird baths, non-functioning fountains, watering cans, sump-pump discharge, and air conditioner and related discharge. Once identified remove and/or drain the breeding site, if practical. Also inspect all windows and doors for screens in disrepair. If necessary, collect specimens to be identified by the local extension office.

Assessment:

Once inspection information is gathered the PMP then determines the best management strategy and discusses it with customer to be sure the customer's needs and concerns are met. This may require the customer to contact mosquito-abatement agencies to address large breeding sites such as ponds.

Treatment:

Once assessment is complete an exterior treatment program is then developed. Talstar® Professional insecticide offers the benefit of a long lasting adulticide and a high kill rate by allowing mosquitoes to rest on treated surfaces for longer periods. This is due to the



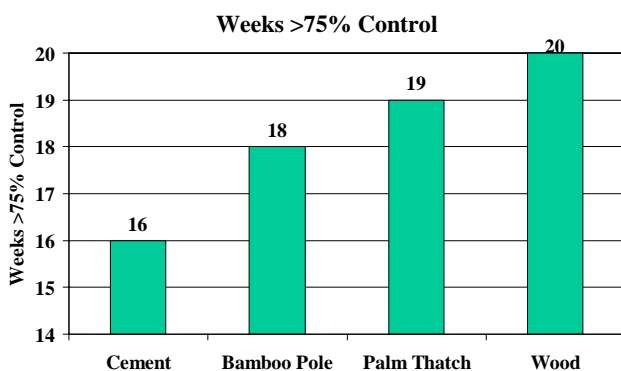
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low repellency of Talstar. If mosquito resting sites are found around landscaping, lawns, or buildings, apply Talstar Professional insecticide as a general spray around these areas using 0.33 fl. oz. to 1.0 fl. oz. per 1,000 square feet; see the label for specific dilution instructions. If mosquito resting sites include ornamental plants then Talstar Professional insecticide will provide excellent control under typical conditions when applied to ornamentals as a full coverage foliar spray where mosquitoes may be present. Use 0.125 fl. oz. to 1.0 fl. oz. of Talstar Professional insecticide per 1,000 sq. ft. which is 5.4 fl. oz. to 43.8 fl. oz. per 100 gallon tank of water. Using the higher rate will result in longer residual and better control in high populations.

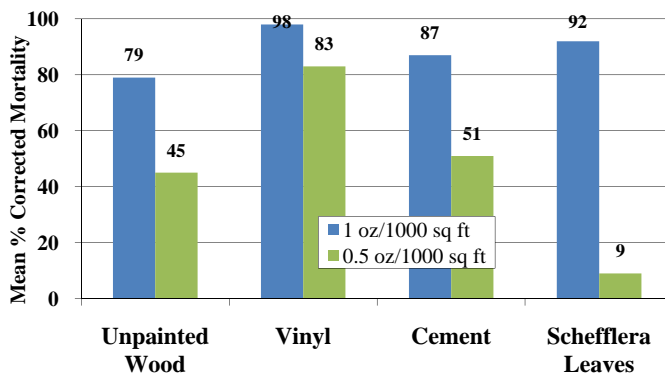
An additional tool for control of mosquitoes and other biting flies is the Purge™ III in our macro metered dispensers. Purge III is equivalent to a mini mosquito misting system and will treat 6,000 cubic feet of unobstructed space. Purge III is excellent for mosquito control in patios and indoor spaces. Placement of the macro dispenser is easy and avoids the meddlesome installation of a large misting system which can disrupt the yard and landscape. Place the dispenser between 8 to 12 feet high, and turn the metered dispenser on one hour prior to needed control and one hour after control is no longer needed. Effectiveness of Purge III occurs within several hours after activation. Furthermore, with our programmable dispensers Purge III can be set to dispense at particular intervals for whenever control is needed.

Residual Control of Mosquitoes with Bifenthrin on Surfaces in Mexico
Anopheles Mortality >75%



Equivalent to 1 oz Talstar® Professional /1000 sq ft
 Instituto Nacional de Salud Publica Centro de Investigacion de Paludismo, 2000. WHO Phase III.

Mosquito Control after 2 Hours Exposure to Surfaces Treated with Talstar® Professional 8 Weeks Earlier



Aedes aegypti adult mosquitoes, held on treated surfaces for two hours then, transferred to clean arenas. Four (4) reps of 10 insects. FMC in-house trial 03SCS127.