

FIELD EVALUATION OF MOSQUITO LARVICIDES IN CATCH BASIN SYSTEMS (2020 UPDATE)

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ABSTRACT

For many communities, catch basins represent a primary source of pestiferous mosquitoes during summer months. In these cities and towns, the staff of the Central Massachusetts Mosquito Control Project performs larvicidal treatments of storm drain systems to reduce levels of *Culex* mosquitoes. This is an important mosquito control activity for public health officials as several *Culex* species are known to harbor and transmit West Nile virus among other mosquito-borne diseases. There are several different products available for use in storm drains with three, Altosid® WSP, FourStar® 45, and FourStar® 90 being evaluated in this project. All are currently utilized by CMMCP in the catch basin larvicide program. Over the course of this field trial for Altosid® WSP, FourStar® 45, and FourStar® 90, it was found that all three products provided significant control of mosquito larvae in storm drains.

BACKGROUND

Culex mosquitoes, long known to develop in storm water systems, are of significant public health importance because of their role in the transmission of West Nile virus (WNV) in the United States. More specifically, *Cx. pipiens* and *Cx. restuans* have been identified as an abundant species in the Northeast United States that can harbor WNV (Anderson 2011; Butler 2006). Several mosquito control products have been specifically engineered for use in storm drains, targeting these species while they develop. Three of these particular larvicides currently utilized by CMMCP staff include Altosid® WSP, FourStar® 45, and FourStar® 90.

Altosid® WSP (EPA Reg. No. 2724-448) are water soluble pouches that contain the active ingredient methoprene. A juvenile hormone mimic, growth

regulator, methoprene acts by preventing the adult mosquitoes from successfully emerging. Studies have been conducted using this formulation in the laboratory setting as well as observations from the field (Butler 2006; Harbison 2018). FourStar® 45 and FourStar® 90 (EPA Reg. No. 83362-3) briquets are slow release combinations of *Bacillus thuringiensis israelensis* (*Bti*) and *Bacillus sphaericus* (*Bs*). These two bacteria produce crystalline toxins that kill mosquito larvae when ingested. Various formulations of these two bacteria have been developed and their success against mosquitoes, including *Culex*, is well documented (Anderson 2011).

MATERIALS & METHODS

Once the three products, Altosid® WSP, FourStar® 45, and FourStar® 90, were selected for evaluation, separate local neighborhoods with extensive basin

systems were designated for each treatment type. Although only a few storm drains would be monitored in each system, all basins were treated within a network to ensure the same conditions were present in that particular neighborhood. All treatments were conducted according to the current product labels and catch basins were retreated with the same products at expiration of the previous applications.

To gauge the effectiveness of the storm basin larvicide products weekly inspections occurred within the specific treatment storm drain networks. Several basins treated with each product type were marked for repeated inspection. Because there are differences in the control mechanisms between the three products, the product evaluations were tailored to the product. The storm drains treated with either FourStar® 45 or FourStar® 90 were monitored visually with a high-powered light. If mosquito larvae were observed within the storm drain, it was considered positive for mosquito larvae. Due to methoprene allowing mosquito larvae to progress towards the pupal stage, those basins treated with Altosid® WSP were sampled using a modified dipper to collect surface water in the basin. These water samples were then transferred to emergence containers and larvae were monitored to determine if they would successfully emerge as adults or be impacted from the methoprene and not emerge as fully developed. Only if mature adult mosquitoes emerged, would the Altosid® WSP treatment and inspection be considered a failure.

RESULTS

The percentage of positive larval inspections ranged from 0.00% to

15.00% for individual sites treated with one of the *Bti/Bs* products, with an overall positive percentage of 5.00% for FourStar® 45 and 6.25% for FourStar® 90. The basins treated with Altosid® WSP produced an overall positive larval check percentage of 1.56%, with individual sites ranging from 0.00% to 6.25%. Although the Altosid® WSP treated basins contained mosquito larvae for 1.56% of the field checks, the larvae collected did not eventually emerge as adults, indicating successful treatment (Table 1).

DISCUSSION

It is well documented that catch basin habitats can and will produce significant amounts of *Culex* larvae, which have the potential to amplify and transmit West Nile virus among other mosquito-borne diseases. The evaluation of storm drain treatments is essential considering the public health importance as well as the time and effort spent on these catch basin larvicide programs. This was the second season of evaluating the efficacy of the CMMCP storm drain treatments, which were once again very promising. At this time Altosid® WSP, FourStar® 45, and FourStar® 90 all provide significant control of mosquito larvae in local catch basin systems.

Assessment of these products should continue and potentially be expanded to include more storm drain networks and additional larvicide products. Field inspections could transition to laboratory bioassays of larvae, or a combination of the two methods. Larval bioassays would allow for direct testing of a single mosquito species, reared to a consistent suitable instar stage, and permit a control without permitting wild mosquitoes to develop.

Table 1: Inspection Results of Catch Basin Treatment Types

| Treatment Type | Site # | % Positive | Overall % Positive |
|---------------------|--------|------------|--------------------|
| FourStar® 45 | 1 | 10.00% | 5.00% |
| | 2 | 0.00% | |
| | 3 | 10.00% | |
| | 4 | 0.00% | |
| FourStar® 90 | 1 | 0.00% | 6.25% |
| | 2 | 10.00% | |
| | 3 | 15.00% | |
| | 4 | 0.00% | |
| Altosid® WSP | 1 | 0.00% | 1.56%* |
| | 2 | 6.25% | |
| | 3 | 0.00% | |
| | 4 | 0.00% | |

* No collected larvae successfully emerged as adults

REFERENCES

Anderson, JF, Ferrandino FJ, Dingman DW, Main AJ, Andreadis TG, Becnel JJ. 2011. Control of Mosquitoes in Catch Basins in Connecticut with *Bacillus Thuringiensis Israelensis*, *Bacillus Sphaericus*, and Spinosad. Journal of the American Mosquito Control Association. 27(1): 45-55.

Butler M, Lebrun RA, Ginsberg HS, Gettman AD. 2006. Efficacy of Methoprene for Mosquito Control in Storm Water Catch Basins. Journal of the American Mosquito Control Association. 22(2): 333-338.

Harbison JE, Runde AB, Henry M, Hulsebosch B, Meresh A, Johnson H, Nasci RS. 2018. An Operational Evaluation of 3 Methoprene Larvicide Formulations for Use Against Mosquitoes in Catch Basins. Environmental Health Insights 12:1-4.