Field Trials of Barrier Treatment Using Mavrik Perimeter© (tau-fluvalinate) - 2013

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ABSTRACT

To evaluate the effectiveness of the residual synthetic pyrethroid Mavrik Perimeter© (tau-fluvalinate), the Central Massachusetts Mosquito Control Project (CMMCP) conducted a field trial in the summer of 2013. This type of application is typically conducted on surfaces where mosquitoes may rest, such as foliage or building facades. In this study the product was applied to foliage surrounding a recreational field. Local mosquito populations were monitored at this treated field, and also an untreated field, for multiple weeks before and after the barrier applications. Overall, there was a 69.09% reduction in mosquitoes observed at the treatment site following the interventions with Mavrik Perimeter©. Control continued for several weeks until low collection numbers began being experienced at both the control and treatment sites. This residual pyrethroid and similar barrier applications will be reexamine in future seasons to determine if it can become a fixed component of the CMMCP suite of mosquito control practices.

INTRODUCTION

Unlike applications using products with low residual properties, barrier treatments utilize chemicals that remain active for a time, and do not rapidly degrade. This type of treatment has been used by public health agencies to lower mosquito populations and reduce mosquito-borne disease. Through treating surfaces where mosquitoes will be resting, a "barrier" can be established between the potential vectors and those individuals at risk of being impacted by their bite (Cilek 2006). Common surfaces to apply these residual chemicals on include foliage around recreational or other gathering places, bed nets, or interior and exteriors of residential buildings (Anderson 1991, Frances 2007, Matthews 2007).

One specific synthetic pyrethroid used for barrier treatments is tau-fluvalinate, which has been shown to persist for several weeks (Cilek and Hallmon 2008). This product, distributed as Mavrik Perimeter©, (Wellmark International, Schaumburg, IL) (EPA Reg. No. 2724-478), is composed of 22.3% tau-fluvalinate, 2lbs AI/gal. Fluvalinate has also been used against verroa mites in active bee colonies. In these situations, varying

concentrations are applied to either plywood or plastic strips, which are then placed directly into the hives to control the mites (Abd El-Wahab and Ebada 2006). By applying this product after sunset, impacts to the bee populations would be expected to be minimal since the product would be dry the next day when bees would begin foraging in the application area again.

Compared to traditional ultralow volume (ULV) adulticiding, barrier treatments avoid many issues that can negatively impact the success of an application. Foliage and other surfaces, which are essential for a barrier treatment, can limit penetration of ULV spray droplets and reduce efficacy. The timing of ULV applications must also take place when target mosquitoes are actively flying, due to the low residual nature of those particular synthetic pyrethroids (Mount 1998, Reddy 2006).

In general, both of these factors, obstructions and timing, do not apply to barrier treatments. This is because residual synthetic pyrethroids are designed to make contact with those barrier mediums, which will then transfer the chemical to the mosquitoes when they land to rest (Cilek 2006). As the presence of host-seeking mosquitoes is not necessary for successful control with a barrier treatment, the time of application is not as vital a factor as it is with ULV treatments (Mount 1998). The eventual reduction in control with a barrier treatment is usually associated with the natural breakdown of the synthetic pyrethroid, and in the case of foliage treatments, new plant growth absent of chemical (Cilek 2006). Field trials were conducted in the summer of 2013 to determine the potential of Mavrik Perimeter© as a barrier treatment for CMMCP.

METHODS

The site selected for this project was a multiple field recreational area, which CMMCP has used in the past for similar projects. These fields were bordered by dense foliage, which was identified as the primary application medium for the barrier treatment. Within this recreational complex, two sites were chosen on opposite sides to serve as the treatment and control locations. Model 512 CDC miniature light traps baited with CO_2 (500ml/min) (John W. Hock Co., Gainesville, FL) were used to gather pre-application surveillance. These collection devices were placed into the open field, far enough away from the foliage barrier to require that any host-seeking mosquito travel across the Mavrik Perimeter© threshold to reach the surveillance trap. Several collections were made at both the treatment and control sites prior to the initial application over the course of six weeks.

Once it was determined that enough pre-application mosquito data had been collected, Mavrik Perimeter© treatments were performed using a modified LECO ULV Model HD. The Mavrik Perimeter© concentrate (2lbs AI/gal) was diluted in water to 0.1oz/gal and dispensed at a flow rate of approximately 1gal/min, with the vehicle traveling at approximately

10mph. As per the product label, these applications were not conducted when honey bees were actively foraging. Following an application, visual confirmation was made as to whether or not the product had been properly applied to the border foliage. These observations indicated that the first treatment was not sufficiently applied around this site, which prompted a second application a week later.

In the weeks following this second application, several more collections were made at both sites until local populations stabilized, which was towards the end of the season and outside the realm of intervention control. The mosquito surveillance collections from both sites were identified by species (Andreadis 2005). All of the surveillance figures were then plotted to determine the level of control achieved through the barrier treatment with Mavrik Perimeter©. The collection averages from before and after interventions were also calculated to assist in this comparison.

RESULTS

Surveillance conducted prior to any application involved weekly collections over six weeks in which significant average trap collections were observed for both the treatment and control sites (approximately 180 and 787 respectively). Following the initial application the treatment site experienced a slight decrease, while the control site, a slight increase. Despite these results, the visual check of the foliage immediately following the first application prompted the second treatment a week later (Figure 1). After the second application to the end of the project, the treatment site had a decrease of 69.09%, while the control site observed much more modest decrease of 8.59% (Figures 2, 3).

Figure 1: Comparison of Weekly Collections for Project Sites

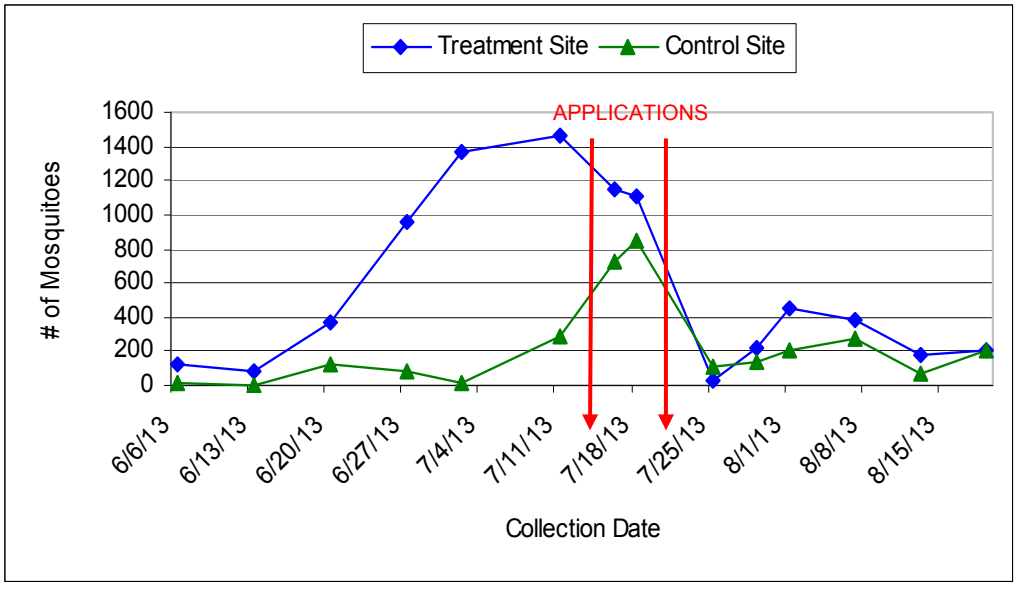
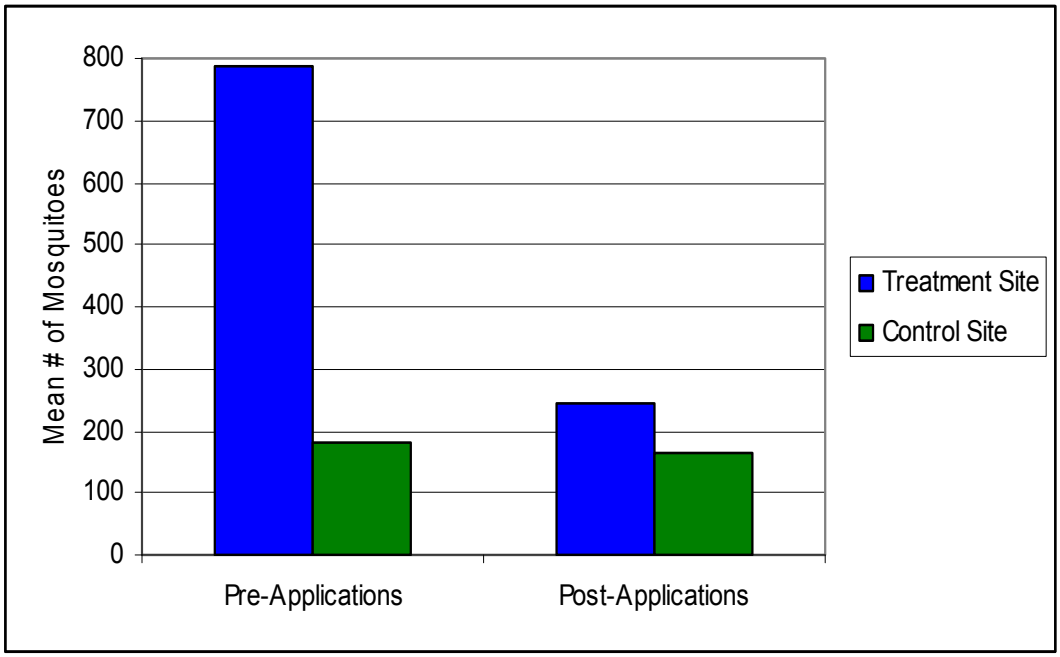


Figure 2: Trap Site Collection Means (%Δ From Previous Collection Period)

	Pre-Applications	Post-Applications
Control Site	180.14	164.67(-8.59%)
Treatment Site	787.14	243.33(-69.09%)

Figure 3: Comparison of Trap Site Collection Means



DISCUSSION

Mosquito collections indicated a slight degree of control following the initial application, but observations of the foliage seemed to show that there was insufficient coverage with the Mavrik Perimeter© solution. The inadequate coverage may have been caused by an improper spray head angle in relation to the vehicle's distance from the foliage border. The speed of the vehicle may also not have been conducive to treating the mid to lower portion of the vegetation. It was also feared that a significant rain event in the days following the first intervention may drastically reduce the effectiveness of the intervention. These factors led to the decision to conduct a second application.

After adjusting for the perceived issues of the first intervention, and increasing the proposed coverage around the treatment field, the second application was conducted a week later. This event resulted in significantly more control than the initial intervention. The comparison of average trap collections prior to and following the interventions demonstrated a significant level of control. The reduction of 69.09% at the treatment site lasted until collections ended, but towards the end of the project may have also been aided by lower trap night temperatures. The eventually

breakdown of the tau-fluvalinate, development of new foliage, and rain events following treatment all could have reduced the level of control. The natural reduction of 8.59% experienced at the control site additionally supports the level of control achieved with Mavrik Perimeter©.

Barrier treatments with products such as Mavrik Perimeter© have their advantages operationally. Instead of requiring numerous applications of low residual ULV products, an intervention of this manner can provide control for a much longer period of time without the need for repeat treatments. With proper timing, a barrier treatment around a recreational field could limit host-seeking mosquitoes through the seasonal peaks and traditional mosquito season. Considering beneficial non-target insects such as honey bees are not impacted after the application once the product has dried, these Mavrik Perimeter© treatments further become an attractive option for prolonged control. CMMCP will continue to evaluate Mavrik Perimeter© and other barrier treatments as a viable means of reducing local host-seeking mosquitoes and protect the public health of central Massachusetts.

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