



Interdisciplinary collaboration between engineering, mathematics and science

# SEMS Research Highlights



## The Spider Story - how pesticides are affecting the fight against agricultural pests

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This newsletter presents the research conducted within the School of Engineering, Mathematics and Science (SEMS) at Robert Morris University (RMU). It covers various relevant topics including: interdisciplinary efforts, successful research grants, student research, posters and papers, journal publications, presentations at national and international conferences, contribution to professional societies, STEM educational research, industrial consulting collaborations and applied research.

There is a quiet war waging in agricultural fields and home gardens throughout the world. Humans are fighting insect pests that threaten the quality and quantity of crops. Chemical pesticides have been the primary weapon humans use — 115 million lbs/yr just in the US. However, pesticide use has many problems, including many damaging effects on non-target wildlife like bees, fish, and amphibians as well as a growing resistance of pests to the chemicals. Nature has provided a natural ally— spiders. Species like the striped lynx spider are excellent predators of the very pests farmers are fighting. The problem is that the effects of pesticides on spiders are largely unknown. Dr. Catherine (Catie) Hanna, her students, and her research partner, Dr. Chad Hanna of California University of PA study

the effects of some of the most widely used pesticides on the striped lynx spider. Caitlyn Brown, a 2012 graduate, studied the effects of duration of exposure on predation for her senior thesis. They found that two different pesticides, malathion and bifenthrin, had very different effects on spiders' ability to catch prey. Malathion had very little effect on behavior, but killed the spiders after about 3 days. In contrast, spiders exposed to bifenthrin suffered behavioral effects that prevented prey capture, and those effects became more exacerbated with time, but did not cause significant mortality. The mode of exposure was also important; predation was negatively effected when spiders contacted residues, like those they would contact by walking on sprayed foliage. However, when they were given prey that

had been exposed, there was no effect. This research, published in the Bulletin of Environmental Contamination and Toxicology, helps farmers to design strategies to maximize their attack on crop pests. By understanding the effects of pesticides on allies in the war, strategies to maximize the impact of both chemical warfare and attack from natural predators can be maximized.



Female striped lynx spider, *Oxyopes salticus*, in hunting stance.

Caitlyn Brown, Chadwick J Hanna, Catherine JB Hanna. The Importance of Pesticide Exposure Duration and Mode on the Foraging of an Agricultural Pest Predator. Bulletin of Environmental Contamination and Toxicology, DOI: 10.1007/s00128-014-1425-0



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