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Investigation of photodegradation of Thiamethoxam and Acetamiprid in aqueous environment under UVB in 4, 7 and 9 pH

ABSTRACT

Background: Thiamethoxam and Acetamiprid are two types of neonicotinoid insecticides widely used for agricultural treatments since the 1990s**.** They have been named as Contaminants of Emerging Concerns since they have been found to contribute to harmful contamination of surface and subsurface water when used for agricultural purposes and poses death risks to non-target organisms. Finding remedies or alternatives to the NEOs is important.

Objective: The study investigates the photodegradation of thiamethoxam and Acetamiprid in natural water under different pH conditions (pH 4, 7 and 9).

Methods: The effects of light with differing wavelengths were examined using natural single ultraviolet B (UVB) light sources. HPLC and DI water have been used in the experiments. Analysis of the degradation was carried out using LC-MS,

Results: The results indicated that UVB played a key role in the photodegradation of thiamethoxam. The degradations of thiamethoxam under the light source followed the first-order kinetics. The half-life of Thiamethoxam in deionized water when exposed to UVB was 58,69 and 50 minutes at 4,7 and 9 pH, respectively. Acetamiprid, however, was stable when exposed to UVB at 4, 7 and 9 pH.

Conclusion: The results indicate that the pesticide persists in the environment at different rates depending on the alkalinity of the water environment. It has been found that the neutral pH favored the photodegradation of thiamethoxam, whereas the alkaline medium had a greater impact on photodegradation of neonicotinoids, as opposed to the acidic media. Acetamiprid displayed stability in acidic, neutral and the basic medium.

Recommendation: The research is ongoing and is funded by NSF. We are working to investigate the influence of pH in combination with other factors such as temperature, surface water and the presence of minerals. We recommend that other degradation pathways be explored, including hydrolysis, aerobics and anaerobic degradation.