

USDA Releases Study Results on the Efficacy of Sodium Bicarbonate (Baking Soda) to Control Invasive Coqui Frogs in Hawaii

The U.S. Department of Agriculture's (USDA) Wildlife Services National Wildlife Research Center (NWRC), in collaboration with the County of Hawaii and the Hawaii Department of Agriculture, recently released findings from a study on the effectiveness of sodium bicarbonate (baking soda) as a control method for invasive coqui frogs (*Eleutherodactylus coqui*) in Hawaii.

Coqui frogs are native to the Caribbean and have affected Hawaii's floriculture and agriculture industries. They also have affected real estate, private industry and human health because of the high volume of their mating behavior. Frogs found in certified nurseries result in quarantine issues that impact the exportation of disease- and pest-free nursery products to the mainland and destinations abroad. Coqui frogs also threaten Hawaii's fragile habitat of rare and endangered plants and animals because they are abundant with no predators.

The study investigated the toxicity of sodium bicarbonate to coqui frogs, determined the lowest application rate that the frogs would have 80 percent mortality after 24 hours and determined an application and solution concentration rate for possible registration purposes to help control this invasive species.

USDA scientists evaluated the efficacy of two applications (a powder and a slurry solution) and four grades (United States Pharmacopeia (USP) #1 powder, USP #2 fine granular, USP #5 course granular and industrial powder) of sodium bicarbonate under laboratory conditions. Key findings from the study include the following:

- USP #1, the finest grade of the four sodium bicarbonate powders tested, was found to be the most effective and one of the least expensive powders, sold at \$24.30 per 100 pounds.
- A powder application rate of USP #1 at 400 pounds per acre was the lowest application resulting in 80 percent mortality 24 hours after initial exposure.
- A slurry solution of 25 percent concentration USP #1 was the lowest application resulting in 80 percent mortality after 24 hours of initial exposure.

Based on the results of this study, USDA and its partners plan to conduct future studies on the field efficacy and nontarget effects of sodium bicarbonate. In addition, other chemicals will be evaluated for their efficacy as potential frog toxicants.

During the past seven years, scientists have conducted multiple studies to investigate the use of chemical agents to control invasive coqui frogs throughout the islands of Hawaii, Maui, Oahu and Kauai. Four chemical agents (caffeine, citric acid, hydrated lime and endosulfan) have been identified as effective frog toxicants. However, only one—citric acid—is currently registered for frog control. Citric acid can be phytotoxic to sensitive plants and there is reluctance in the public sector to use this chemical due to its high cost. Therefore, there is a strong need for additional control options and methods.

The mission of USDA's NWRC is to apply scientific expertise to resolve human-wildlife conflicts while maintaining the quality of the environment shared with wildlife. NWRC develops methods and information to address human-wildlife conflicts related to the following:

- Agriculture (crops, livestock, aquaculture, and timber),
- Human health and safety (wildlife disease, aviation),
- Property damage,
- Invasive species, and
- Threatened and endangered species.

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