Environmental Impact of Artificial Sweeteners Acesulfame, Sucralose, and Saccharin in Nature

Wang, Qihang

Acesulfame, sucralose, and saccharin are artificial sweeteners and used as sugar substitutes in foods and beverages. From last year’s research, it was found that these sweeteners could not be biodegraded by soil organisms for a total of the 4 week testing period. Using Daphnia magna as a testing model, the results showed that D. magna could not survive in a mixture of acesulfame, sucralose, and saccharin above 0.2 mg/mL. The reproduction of D. magna was inhibited. Which sweetener would give more problems? What level of each sweetener can cause environmental problems? With the aim of resolving these questions, a consecutive study using Daphnia magna to evaluate the effects of individual sweeteners in different concentrations was conducted. Following the OECD guidelines for the Testing of Chemicals, experiments involving a Daphnia magna living system with acesulfame, sucralose, and saccharin, respectively, at concentrations 0.025, 0.05, and 0.1 mg/mL were done. D. magna could not produce next generation in the 3 week testing period for acesulfame and saccharin, but some D. magna in the saccharin solution produced eggs in their bodies in the 3rd week. For the sucralose test, D. magna produced the 2nd generation within 9-12 days. In conclusion, this study shows that acesulfame, sucralose, and saccharin can accumulate and cause environmental problems in nature. In a Daphnia magna living system with acesulfame or saccharin, levels above 0.025 mg/mL caused the animals to have reproduction problems. Thus to protect the environment, acesulfame, sucralose, and saccharin should be limited in foods and beverages.

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