The Effect of Rosmarinic Acid and the Pesticide Thiamethoxam on the Survival and Circadian Rhythm of Honey Bees (Apis mellifera) in Puerto Rico

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Honey bees rely heavily on their circadian clock to achieve the orientation based on the solar compass and the "time memory", which allows them to locate food resources and return to the hive. Currently, the continuous losses of honey bees (Apis mellifera) raise a concern about their significant effect on agricultural productivity. One of the main causes of losses is the exposure to neonicotinoid pesticides that deteriorate bees' foraging capacity and compromise their central nervous system, causing death. In this study, forager bees were used to evaluate the effect of Thiamethoxam, a neonicotinoid pesticide, and Rosmarinic acid, an antioxidant, on the mortality and circadian rhythm of the honey bees in Puerto Rico. Two trials were carried out by using four monitors in the first trial and eight in the second to examine the locomotor activity for eight days. Each trial used different concentrations of both the pesticide and the antioxidant, that were administered directly in the food (honey/sugar). The results obtained indicated that the high dose (40µg/g) of the antioxidant was not harmful to honey bees and significantly increased their rhythmicity compared to the control group. The pesticide and antioxidant combined did not significantly improve the survival rate nor the rhythmicity of the honey bees at the medium doses. Despite of this, our results showed that high doses of Rosmarinic acid can regularize the rhythmicity of honey bees, which can be used as a baseline for future studies to assess the effect of Rosmarinic acid.

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