An Enzymatic Approach to Treating Colony Collapse Disorder in Pollinating Bee Populations as a Result of Neonicotinoid Pesticides

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Bee populations are responsible for the pollination and creation of nearly 70% of agricultural products sold worldwide. Their importance in the continuity of a sustainable biosphere is immense. Therefore, the sudden loss of their population numbers is startling and requires immediate action. Neonicotinoids and systemic pesticides have been determined as a probable cause of Colony Collapse Disorder (CCD), the widespread loss of bee colonies. In order to mitigate these population losses, the Cytochrome P450 2D6 enzyme was identified as a possible catalyst of neonicotinoids that could essentially be used to detoxify bees of pesticides through their food source. In order to test this, samples of Lumbriculus variegatus (California blackworms) were exposed to various sub-lethal concentrations of thiamethoxam, the most widely used neonicotinoid on the market. They were also exposed to these concentrations and a sample of the CYP2D6 enzyme. Their heartrates were then recorded. In the presence of only the pesticide, sample groups had heartrate increase that correlated to concentration level, while in the presence of both the enzyme and the thiamethoxam, heartrate level increase was drastically minimized, and heartrates in some cases normalized to control levels. From this research, we can surmise that the Cytochrome P450 2D6 enzyme shows promise as a possible enzymatic treatment plan for Colony Collapse Disorder in commercial pollinator populations.

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