Analysis of Genic Expression of Honey Bees Exposed to Sublethal Pesticides Doses Using the Transcriptome Technique

Authors : Ricardo de Oliveira Orsi, Aline Astolfi, Daniel Diego Mendes, Isabella Cristina de Castro Lippi, Jaine da Luz Scheffer, Yan Souza Lima, Juliana Lunardi, Giovanna do Padro Ribeiro, Samir Moura Kadri

Abstract : NECTAR Brazilian group (Center of Education, Science, and Technology in Rational Beekeeping) conducted studies on the pesticides honey bees effects using the transcriptome sequencing (RNA-Seq) analyzes for gene expression studies. In this way, we analyzed the effects of Pyraclostrobin and Fipronil on the honey bees with 21 old-days (forager) in laboratory conditions. For this, frames containing sealed brood were removed from the beehives and maintenance on the stove (32°C and 75% humidity) until the bees were born. So, newly emerged workers were marked on the pronotum with a non-toxic pen and reintroduced into their original hives. After 21 days, 120 marked bees were collected with an entomological forces and immediately stored in Petri dishes, perforated to ensure ventilation, and kept fasted for 3 hours. These honeybees were exposed to food contaminated or not with the sublethal dose of Pyraclostrobin (850 ppb/bee) or Fipronil (2.5 ppb/bee). After four hours of exposure, 15 bees from each treatment were referred to transcriptome analysis. Total RNA analysis was extracted from the brain pools (03 brains per pool) using the TRIzol® reagent protocol according to the manufacturer's instructions. cDNA libraries were constructed, and the FASTQC program was used to check adapter content and assess the quality of raw reads. Differential expression analysis was performed with the DESeq2 package. Genes that had an adjusted value of less than 0.05 were considered to be significantly up-regulated. Regarding the Pyraclostrobin, alterations were observed in the pattern of 17 gene related to of antioxidant system, cellular respiration, glucose metabolism, and regulation of juvenile hormone and the hormone insulin. Glyphosate altered the 10 gene related to the digestive system, exoskeleton composition, vitamin E transport, and antioxidant system. The results indicate that the necessity of studies using the sublethal doses to evaluate the pesticides uses and risks on crops and its effects on the honey bees.

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