J. Int. Environmental Application & Science, Vol. 10(1): 26-36 (2014)

Evaluation of the Comparative Acute Toxic Effects of TiO_2, Ag-TiO_2 and ZnO-TiO_2 Composite Nanoparticles on Honey Bee (*Apis mellifera*)

Yeşim Özkan[1*], İlhan Irende[2], Gökhan Akdeniz[3], Dilek Kabakçi[3], Münevver Sökmen[4]

[1]Biology Department, Faculty of Art and Sciences, Ordu University, Ordu, Turkey; [2] Medical Biochemistry, Institute of Health Sciences, Karadeniz Technical University Trabzon, Turkey; [3] Ministry of Food, Agriculture nd Livestock, Apiculture Research Station Department, Ordu, Turkey; [4] Chemistry Department, Karadeniz Teknik University, Box 61100 Trabzon, Turkey

Received November 12, 2014; Accepted March 17, 2015

Abstract: Titanium dioxide nanoparticles (TiO_2) have been used in the production of a wide range of products. Therefore, in nature oscillation of nanoparticles TiO_2 is greater. Honey bees (*Apis mellifera*), the breeding of which have been practised in many parts of the world. Humans that fed with these products, honey bee and bee products (such as pollen, propolis) is thought to be affected by nanoparticles in nature. We aimed to make the first toxicological evaluation of silver nanoparticles loaded into TiO_2 (Ag-TiO_2) and TiO_2 and the zinc oxide (ZnO-TiO_2) composite in a honey bee (*Apis mellifera*). Results showed that, no mortality occurred throughout the experiment, and no behavioral anomaly/abnormality was determined in control groups. The LC_{50} values assessed for 96 hours are 5.865 mg/l for TiO_2, 6.315 mg/l for ZnO-TiO_2, and 312.845 mg/l for Ag-TiO_2. The toxic effect of the ZnO-TiO_2 composite is caused by the zinc oxide nanoparticle loaded into TiO_2 nanoparticle. The concentration group which made the most difference in all the other concentration groups on the mortality rates in nanoparticles was 100 mg/l concentration for TiO_2, 1mg/l for ZnO-TiO_2, and 10 mg/l concentration for Ag-TiO_2. In this study, the toxic effect of TiO_2, ZnO-TiO_2 and Ag-TiO_2 nanoparticles increased along with the increase in the concentration and the exposure time.

Keywords: TiO_2, Nanoparticles, Acute Toxicity, *Apis mellifera*

[*]*Corresponding: E-Mail: yozkan52@gmail.com; Tel: +90 05321594062 Fax: +90 0452 233 91*