Toxicity evaluation of instant coffee via zebrafish (Danio rerio) embryo acute toxicity test

ABSTRACT

Coffee is one of the most popular beverages in the world. However, the safety level of some instant pre-mixed coffees available in Malaysia is questionable as there have been reports of adverse effects and psychoactive chemical contents. This study aims to evaluate the toxicity level of instant coffee sold around Selangor, Malaysia. A total of 13 types of instant coffees were collected and the toxicity assessed through zebrafish (Danio rerio) embryo acute toxicity test (ZFET). The survival rate, hatching rate, heartbeat rate, and scoliosis were observed. Data were analyzed using linear regression and one-way ANOVA. The LC50 was calculated and was compared with the positive control and LC50 of caffeine. Four coffee samples did not exhibit an effect on zebrafish survival rate; however the rest of the coffee samples caused death in zebrafish. Three coffee samples namely samples 11, 12 and 13 caused a very low hatching rate. A normal heartbeat rate for zebrafish is between 120 to 170 beat per minute which was similar in zebrafish of both the control group and those exposed to coffee samples 4 and 10. The rest of the coffee samples caused an abnormally low range of heartbeat per minute. There was no scoliosis observed in this study. In a nutshell, this study suggests that some of the pre-mixed coffee has the potential to cause health problems due to the toxic reaction of an anonymous compound that could be toxic to humans.

Keyword : Danio rerio embryo; Heartbeat per minute; Instant coffee; Toxicity activity.