PROTECTIVE EFFECTS OF RESVERATROL AGAINST IMIDACLOPRID INDUCED TOXICITY IN ZEBRAFISH (*Danio rerio*)

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INTRODUCTION: Imidacloprid (IMI), a pesticide widely used in agriculture, is known for its neurotoxic effects on aquatic organisms, including zebrafish (Danio rerio). Resveratrol (RES), a natural polyphenol with well-established antioxidant and neuroprotective properties, may mitigate pesticide-induced damage by modulating oxidative stress and inflammatory pathways. OBJECTIVE: To investigate the protective potential of RES against IMI-induced toxicity in zebrafish, focusing on oxidative stress and neurotoxicity biomarkers. MATERIALS AND METHODS: Adult zebrafish were fed for 60 days with diets supplemented with RES at four concentrations: R1 (0.3 g/kg), R2 (0.6 g/kg), R3 (2.5 g/kg), and R4 (5 g/kg), replacing cellulose accordingly. A control group received a RES-free diet (CTE). After the feeding period, fish were exposed to 45 µg/L IMI via water for 96 hours. Each treatment was performed in duplicate (9 fish per tank, 20 L). Brain and blood samples were analyzed for TBARS, protein carbonyls, blood glucose, and AChE and GST activities, as described in Guerra et al. (2021). Blood glucose levels were measured using a portable glucometer. RESULTS AND DISCUSSION: IMI exposure significantly reduced AChE activity and blood glucose levels, while increasing TBARS, protein carbonyls, and GST activity, indicating oxidative stress and neurochemical impairment. RES showed dose-dependent protective effects: concentrations R1 to R3 restored biomarker levels to baseline, whereas R4 led to exacerbated responses, with AChE and GST levels exceeding those of the control. These findings suggest that RES exerts protective effects by reducing reactive oxygen species (ROS), preserving protein and lipid integrity, and potentially modulating cholinergic pathways. The biphasic response observed with R4 indicates a possible threshold of RES toxicity at high concentrations, underscoring the importance of critical evaluation of the dose-response relationship. CONCLUSION: RES mitigated IMI-induced neurotoxic and oxidative damage in zebrafish brain in a concentration-dependent manner, highlighting its potential as a protective agent. However, high concentrations may trigger adverse effects, indicating the need to define a safe therapeutic range.

Keywords: pesticides; antioxidants; neuroprotection; biomarkers. Funding source: Research productivity grant PQ - process: 312634/2023-4.