

## Moringa olifera Curate The Toxic Potential of CuO Nanoparticles in Oreochromis mossambicus

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**Abstract :** The study assessed the curative potential of Moringa olifera seeds against copper oxide nanoparticles induced toxicity in Oreochromis mossambicus. In order to investigate the curative potential of M. olifera seeds, firstly we examine its chemical composition, secondary metabolites, and bioactive compounds including hydroxyl-cinnamic acids, flavanols and hydroxybenzoic acids through standard methods and high performance liquid chromatography. In current study, the potential sub-lethal toxic dose of CuO-NPs (0.12 mg/l) was investigated through pilot experiment and three non-lethal doses (low=32, medium=48 and high=96 mg/l) of M. olifera were selected on the basis of its LC50 value for O. mossambicus. The experimental fish, O. mossambicus (n=100 of approximately 20 g each) were procured from Manawan Fisheries Complex, Lahore, and acclimatized for two weeks in glass aquaria. Experiment was conducted in accordance with the guidelines of Institutional Animal Ethics Committee, Government College University Faisalabad, Pakistan. During acclimatization and experimental period, fish received the commercial fish feed at 2.5% body weight daily. In order to assess the curative effect of M. olifera against CuO NPs induced toxicity, O. mossambicus were randomly divided into five groups and were designated as control (C) without any treatment, positive control (G\*) exposed to potential toxic dose of CuO-NPs at 0.12 mg/l, and three treated groups namely G1, G2, and G3 co-treated with 0.12 mg/l of CuO-NPs plus different doses of M. olifera seed extract at 32, 48, and 96 mg/l, respectively for 56 days. Fish were exposed to waterborne CuO NPs and M. olifera seed extract. CuO-NPs treatment was ceased after 28 days but the doses of M. olifera were continued for 56 days. Blood was taken after 28 and 56 days through caudal venipuncture. Liver and intestine were taken for oxidative stress and histological studies after 56 days. In M. olifera seeds, moisture contents, crude protein, lipids, carbohydrates and ash were recorded as 3.8, 37.83, 32.52, 46.12, and 7.75%, respectively on dry weight basis. Total energy was recorded as 627.36 kcal/100g. Qualitative analysis of M. olifera seeds showed the presence of terpenoids, saponins, flavonoids, alkaloids and phenolics, while its quantitative analysis showed the considerable amount of total phenolics, flavonoids, saponins, and alkaloids as 134.75, 170.15, 1.57, and 0.4 µg/mg, respectively. Analysis of bioactive compounds in M. olifera seeds showed the presence of hydroxy-cinnamic acids (6.07 µg/ml), flavanols (71.72 µg/ml), and hydroxyl benzoic acids (97.82 µg/ml). The results showed that M. olifera seed extract at 48 and 96 mg/l was able to cure against the toxic effects of CuO-NPs. The significant changes were observed in G\* and G1 for sero-hepatic enzymes, anti-oxidants and histological profile. The investigations of this study showed that M. olifera is a good curative agent against potential induced toxicity of CuO-NPs in O. mossambicus. The curative effect of M. olifera is attributed to the presence of higher amount of secondary metabolites and bioactive compounds. This study suggested the use of M. olifera to curate different ailments in fish and other organisms.

**Keywords :** CuO nanoparticles, curative, Moringa olifera, Oreochromis mossambicus

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