

## Digestive enzymes activity and growth indices of rainbow trout (*Oncorhynchus mykiss*) fed diets supplemented with silymarin and Nickel Oxide nanoparticles

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### Abstract

There is growing concern regarding nano-sized material discharge into water bodies and their subsequent toxicity to aquatic lives owing to increasingly rapid development and industrial applications of nanoparticles. This study evaluates the oral prescription of silymarin and Nickel Oxide nanoparticles in rainbow trout with an emphasis on growth indices and digestive enzymes activity. To that end, 1200 fish ( $3.83 \pm 0.01$ g) were randomly allotted into 8 distinct treatments including control group without any supplemental dietary Nickel Oxide nanoparticles or silymarin and the remaining seven experimental groups comprised of different combinations of Nickel Oxide nanoparticles (0, 100 and 500 mg /kg feed) and silymarin (0 and 1 g /kg feed) in the first and second month of the trial. All treatments were carried out in triplicate and the experiment lasted for 60 days. Results showed that the highest amylase activity was recorded in treatment 6 ( $16.56 \pm 1.00$ ) (0 mg Nickel nanoparticle along with 1 g silymarin - 500 mg Nickel nanoparticle and 1 g silymarin) which significantly differed from treatments 5 (0 mg Nickel Oxide nanoparticles and 1 mg silymarin-100 mg Nickel Oxide nanoparticles with 1 mg silymarin), 7 and 8 (fed diets containing 100 and 500 mg Nickel Oxide nanoparticles, respectively) ( $P \leq 0.05$ ). The highest alkaline protease activity was observed in treatment 1 ( $0.54 \pm 0.05$ ) (without any supplemental Nickel or silymarin), which was significantly different from those of treatments 7 and 8 ( $P \leq 0.05$ ). The highest lipase activity was reported for treatment 4 ( $1.03 \pm 0.04$ ) (500 mg Nickel nanoparticle with 1 g silymarin- 0 mg nanoparticle and 1 g silymarin) which was significantly different from other treatments ( $P \leq 0.05$ ). The results showed that simultaneous use of Nickel nanoparticle and silymarin in treatments 3, 4, 5 and 6 led to higher digestive enzymes activities in comparison to treatments 7 and 8. However, growth indices did not show any noticeable differences amongst studied treatments. It seems that in a long term exposure to Nickel Oxide nanoparticles and simultaneous dietary silymarin inclusion, it would also be possible to observe differences in growth and nutritional indices, requiring further clarification.

**Keywords:** Digestive enzymes, Growth indices, Nickel Oxide nanoparticles, Silymarin, *Oncorhynchus mykiss*.

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