

## **Inhibition effects of heavy metal and nutrient concentrations on photosynthetic pigments production in green algae *Spirogyra* sp.**

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### **Abstract**

Anthropogenic activities greatly contribute pollutants such as heavy metals to the aquatic environment. Documented empirical evidence of the effect of heavy metals on aquatic systems is still scanty especially in under studied regions such as Africa. This study was done to investigate the effect of copper and zinc concentrations on the primary productivity of green algae, *Spirogyra*. This was achieved by spectrophotometric estimation of photosynthetic pigments (chlorophyll-a, chlorophyll-b, and carotenoids) of algae cultured at different concentrations of both copper and zinc. The first stage of the experiment was to optimize nutrient requirements in growth media of *Spirogyra*, by culturing algae at three different concentrations of compound D (N7: P14: K7) fertilizer. The results showed that the concentration of photosynthetic pigments significantly decreased ( $p < 0.05$ ) with an increase in nutrient concentration. The second stage of the experiment was to expose cultures of *Spirogyra* to different concentrations of zinc and copper. The results showed that the concentration of photosynthetic pigments significantly decreased ( $p < 0.05$ ) with an increase in copper and zinc concentrations. Photosynthetic pigment concentrations cultured at concentrations  $> 25 \text{ mg L}^{-1}$  of both copper and zinc were significantly lower than those of the control (Dunnett's test,  $p < 0.05$ ). At low concentrations ( $< 30 \text{ mg L}^{-1}$ ), Cu had higher effects on carotenoid concentrations than Zn. The results also showed that copper was more toxic to *Spirogyra* compared to zinc. These results show that chlorophyll pigments inhibition by Cu and Zn can be used as a biomarker of exposure. To minimise metal pollution in the aquatic environment, there is a need for industrialists to keep effluent quality at standards recommended by local authorities such as the Environmental Management Agency (EMA).