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Title: Application of permanganate, copper sulfate to the coagulation dose and use of *Moringa oleifera* seeds as a natural coagulant in water treatment plants to remove algae

Adel H. Abouzied and **Hanan A. S. Hassan**.

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ABSTRACT

In Egypt, the Nile River is inhabited by various phytoplankton species through the whole period of examination. In all months, diatoms dominated other groups by numbers, Diatoms numbers of Nile water ranged between 1450 and 11880 Unit/ml; this was followed by green algae which ranged between 700 and 1220 Unit/ml, while the lowest number was observed for blue-green algae which ranged between 160 and 703 Unit/ml. Treatment of Nile water using two chemical coagulants, namely, aluminum sulfate ($Al_2(SO_4)_3.16H_2O$) and aluminum oxide (Al_2O_3) removed algae by about 85% and 90%, respectively, on the addition of a permanganate ($KMnO_4$) dose between 0.4 and 1.0 mg/l to the applied coagulant dose removed algae by about 92.5% and 97.2%, respectively, as well as reduced the chlorine dose and the residual aluminum concentration in the treated water. Also, the addition of a Copper (II) sulfate ($CuSO_4$ instead of permanganate) dose between 0.25 and 1.0 mg/l to the applied coagulant dose removed algae by about 93.8% and 98.1%, respectively. *Moringa oleifera* seeds present a viable alternative natural coagulant, which raises the removal efficiency for the algal groups, and algal removal achieved between 92% and 97% with a dose between 2 and 8 g/l. Algae have been classified and identified through the comparative morphology of algae in identification keys and the Sedgwick-Rafter counting chamber was used to calculate algal numbers.

Keywords: Algal count, Permanganate, Copper sulfate, Chlorine, *Moringa oleifera*, Water treatment.