Towards sustainable drinking water treatment - the use of natural coagulant in the removal of microalgae

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Introdution

The presence of microalgae in drinking water supply can cause significant disturbances. The process water clarification (coagulation/flocculation/dissolved air flotation, C/F/DAF) are used due to good efficiency for removal this contaminant. As a future strategy, the application of natural coagulants to water treatment emerges as a promising ecologically and socially sustainable option. Thus, the aim of this work is the application of the C/F/FAD process with *Moringa oleifera* integral and degreased seeds to removal *Microcystis aeruginosa* from water.

Materials and Methods

***Microcystis aeruginosa* cultive**

✓ASM-1 medium.
✓Cels. concentration 10^6 cel.mL^{-1}

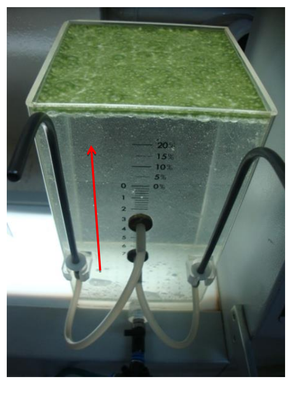
Preparation of coagulants

✓Integral powder seeds: 5g of peeled and crushed were dried at 40ºC until weight.
✓Degreased powder seeds: 5g of peeled and crushed were degreased with ethanol according methodology describe by Sanchez-Martín et al. (2010).
✓It was fixed 100 mg.L^{-l} of *Moringa oleifera* powder seed for each coagulant.

C/F/FAD assays

It was used “Flotest” equipament with the following operations conditions according Moreti et al. (2015):

✓ Rapid mixture gradient (RMG): 1200 s^{-1}
✓ Rapid mixture time (RMT): 20 s
✓ Slow mixture gradient (SMG): 15 s^{-1}
✓ Slow mixture time (SMT): 20 min
✓ Saturation time (ST): 4 min
✓ Saturation pressure (SP): 600 Kpa
✓ Recirculation (R): 30%



Results and Discussion

Characterization of Contaminated water with *Microcystis aeruginosa*

Quality parameters	Contaminated Water
Color	182 uH (1)
Turbidity	35.1 NTU
Chlorophyll-a	160.2 µg.L^{-1}
UV_{254nm}	0.082 cm^{-1}
Celular concentration	2.3 x 106 cel.mL^{-1}
Potencial Zeta	-16,64 mV
DOC	3.4 mg.L^{-1}

(1) Hazen unit = (mg Pt-Co.L^{-1})

C/F/FAD process

	Mo_{int}	Mo_{deg}
Color (%)	64,56 ± 7,3	72,43 ± 5,2
Turbidity (%)	60,01 ± 7,1	77,81 ± 4,5
UV_{254nm} (%)	28,63 ± 9,4	45,58 ± 8,8
Chlorophyll-a (%)	82,4 ± 1,8	91± 3,4
Potencial Zeta (mV)	-13,77	-8,66
DOC (mg.L^{-1})	12,4	14,5

It was observed that residual values of dissolved organic carbon (DOC) were increased in the water treated for the both coagulants based *Moringa oleifera*,

Coagulants	Potencial Zeta (mV)
Mo_{int}	7.87
Mo_{deg}	9.45

Conclusion

It was observed that color, turbidity, chlorophyll-a and UV_{254nm} removal values for Mo_{deg} were more efficient than Mo_{int} and for both coagulants had an increase for DOC.
In relation to potencial zeta, the values after the assays were more negative for Mo_{in} than Mo_{deg}, showing the particles neutralization, as the values obtained for coagulants.