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Biosorption Potential Evaluation of Atrazine by Moringa Seed Husks in Fixed Bed

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Introduction

Atrazine (ATZ)

- One of the most used herbicides on world; Included in the priority substances list of European Comission (EC), United States (US EPA) and Brazil (MH) [1-3].

***Moringa oleifera* Lam (MO)**

- MO seeds have been used as coagulating agent in water treatment and as biosorbents, making its seed husks a waste of your applications.
- Acts with high potential in removal of pollutants in aqueous samples, such as metals and organic compounds [4].

Biosorption in fixed-bed

- Successful regeneration of the adsorbent can be considered as a key process for determining the applicability of an adsorbent in a waterpurification application.

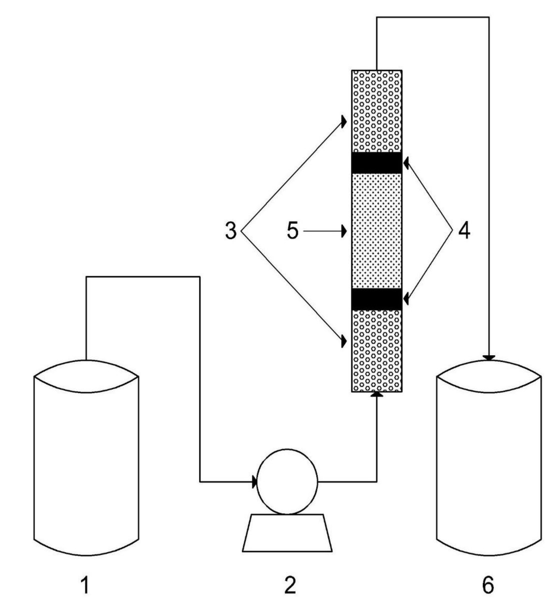
Materials and Methods

Solutions and biosorbent preparations: Solutions were prepared with Atrazine® (Nortox) and ultra-pure water. The initial and final ATZ concentrations were measured by HPLC. MO biosorbent was prepared according the following steps:

Grounding (industrial blender) → **Washing with deionized water** → **Drying at 105°C for 24h in a vacuum oven** → **Grounding and sieving to achieve 600 µm**

Column experiments (Figure 1):

- Five cycles of biosorption–desorption were performed at the same flow rate (1 mL/min) and with ultra-pure water as eluent;
- The experiments were conducted in a glass column of 28 cm height and 0.9 cm inner diameter;
- The bed depth of 13.5 cm (3 g of biosorbent), the inlet concentration of ATZ and pH were kept constant;
- Aqueous solutions containing ATZ were pumped upward through the column by a peristaltic pump;
- All experiments were performed at room temperature (25±1°C).



1. Feed tank (ATZ solution C_0 = 5 mg/L, pH = 7).
2. Peristaltic pump (Masterflex CP 7553-70);
3. Glass beads;
4. Polyamide structure;
5. Biosorbent;
6. Effluent storage tank.

Fig. 1. Schematic diagram of column experiments.

Results and Discussion

Column Experiments

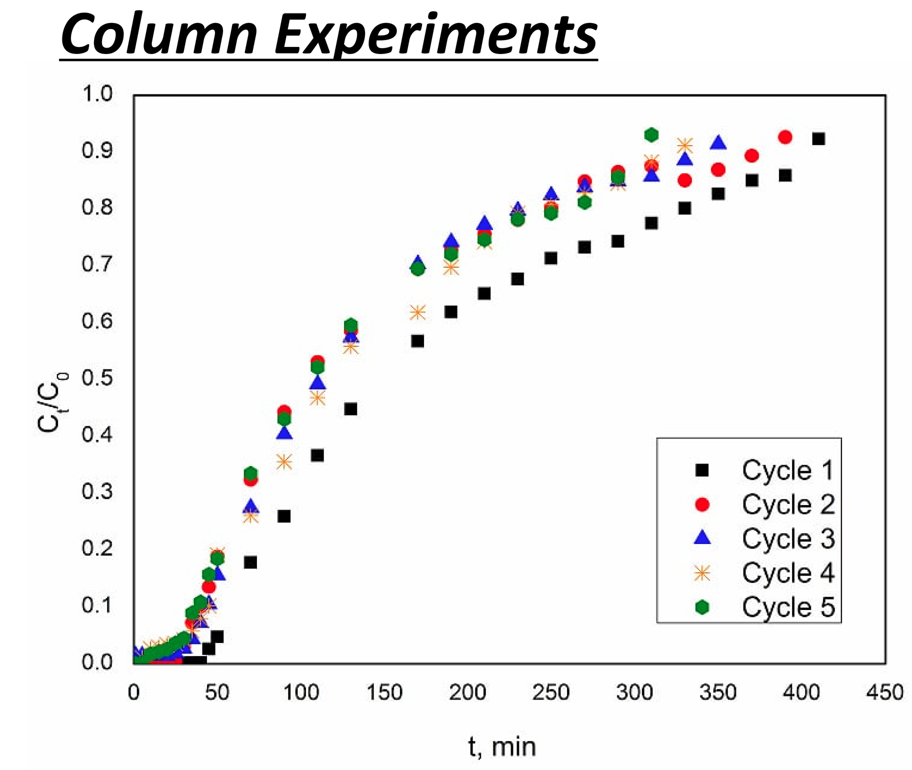


Fig. 2. Breakthrough curves.

Table 1. Sorption process parameters for five cycles.

Cycles	ts (min)	qe (mg/g)	Y(%)
1	402	0.297	46
2	374	0.239	39
3	340	0.232	42
4	321	0.222	46
5	301	0.214	45

Conclusions

The breakthrough curves obtained presented no differences in behaviour, maintaining the same trend throughout all five cycles. However, there was a slight decline in the saturation time, and in the amount of ATZ biosorbed per gram of MO. On the other hand, as the removal efficiency is obtained from the relation between the amount of ATZ transported to the bed and the time required to reach saturation, this parameter remained almost constant. Hence, it was possible to achieve five cycles of biosorption–desorption without loss of biosorption capacity. This study shows that Moringa oleifera Lam seed husks can be used as an effective biosorbent in the removal of ATZ from aqueous solutions using a fixedbed column. Moreover, the biosorbent could be regenerated using a simple and cheap process, highlighting it as a distinctive material in relation to other biosorbent materials presented in the literature. It is important to point out that the alternative forms of water treatment, including biosorption using biomass of agricultural sources as biosorbents, are of great importance, since it would be a viable alternative for water treatment in developing countries, poorest regions and in places where obtaining water drinking is still a challenge.

References

[1] EC. "Directive 2008/105/EC of the European Parliament and of the council". *Official Journal of the European Union*, 2008.
[2] USEPA. *Atrazine Interim Reregistration Eligibility Decision (IRED) Q&A's*. 2003
[3] BRASIL. *Portaria nº 2914 de 12 de Dezembro de 2011*. Ministério da Saúde. 2011
[4] AKHTAR, M. et al. "Sorption potential of Moringa oleifera pods for the removal of organic pollutants from aqueous solutions". *Journal of Hazardous Materials*, v. 141, n. 3, p. 546-556, Mar 22 2007.