# Bio-oil production from the Moringa *oleifera* Lam. cakes

**Samia T. A. Maciel**[1] **(PG), Jorge Henrique Cardoso Reis**[2] **(IC), Juciara dos S. Nascimento**[2] **(PG), Lisiane dos S. Freitas**[2] **(PQ), *Gabriel F. da Silva**[1] **(PQ).**

*1 Laboratório de Tecnologias Alternativas (LTA). Departamento de Engenharia Química Universidade Federal de Sergipe. Av. Marechal Rondon, s/n. Jardim Rosa Elze. São Cristóvão/SE. Tel: (079) 2105-6556.*
*2 Laboratório de Análise de Compostos Orgânicos Poluentes (LCP). Departamento de Química. Universidade Federal de Sergipe. Av. Marechal Rondon, s/n. Jardim Rosa Elze. São Cristóvão/SE. Tel: (079) 2105-6654.*

Keywords: *Moringa oleifera, biomass, pyrolysis, bio-oil..*

## Introdução

The components of the Moringa *oleifera* Lam. are well known for their medicinal and nutritional values. In literature, the biomass is little studied as a producer source of bio-oil. In this context, it is considered important to increase the functionality of the residue obtained from oil extraction of Moringa *oleifera* Lam., in conjunction with potential use in a thermochemical conversion (pyrolysis) of biomass for obtaining bio-oil. Which is a logical way to replace non-renewable sources of cleaner and biosustanaible way.

## Resultados e Discussão

The study of the production of bio-oil was initiated by the characterization of Moringa seed and biomass through proximate and ultimate analysis, heating values (HHV), thermogravimetry (TG) and derivative thermogravimetry analyses (DTG). The moisture contents, ash contents and volatile matters for the biomass waste samples are listed in Table 1.

**Table 1.** Proximate analysis (wt.%) of moringa biomass.

| Sample | Moisture | Ash | Volatile matter |
|---|---|---|---|
| Seed | 7,29 ± 0,20 | 4,91 ± 0,12 | 91,05 ± 0,17 |
| Mechanical cake | 5,92 ± 0,05 | 4,70 ± 0,13 | 83,90 ± 1,32 |
| Chemical cake | 8,74 ± 0,39 | 6,70 ± 0,12 | 89,84 ± 0,26 |

For the moisture contents were observed low content (<10%), characterized as best method for the thermal conversion process of biomass, the pyrolysis[1]. For the ash content were obtained values below 7%. These values characterize relatively low levels, allowing the burning of biomass without loss of yield of the products generated during pyrolysis[2]. The volatile content obtained for the samples were above 83%.This high content has a positive impact on the thermochemical conversion process, where high yields of bio-oil and syngas can be produced[2,3]. The heating values of the samples was determined by equations based on the ultimate analysis[4]. The HHV range between 17 and 19 MJ/Kg. This implies that they can be potencial energy sources in the production of bio-oil[1]. Confirmed the potential of studied biomass in producing biofuel, the thermogravimetric analyzes were performed to determine the optimal temperature pyrolysis. After 500 °C, the moringa does not show any significant mass loss event and can therefore be regarded as an optimum temperature of pyrolysis. This temperature, the total mass conversions were obtained in 77,14, 69,57 and 71,14 % for ultrasonic[5] (n-hexane), mechanical and chemical cakes. Determined the optimal pyrolysis temperature, the samples were submitted to the pyrolysis process in a fixed bed reactor of stainless steel, in temperature of 500 °C, under an inert $N_2$ atmosphere with a flow of 1 and 3 mL/min and 20 g the sample for obtaining bio-oil. The generated bio-oil was chemically characterized a gas chromatograph coupled to mass spectrometry were identified compounds with groups functional as acids, phenols, ketones, hydrocarbons, aldehydes and others. The biomass with oil in your composition shows acids in high concentrations, but the biomass with few oil shows the composition rich in phenols.

## Conclusões

The M. *oleifera* showed is a promising renewable source for production of biofuels. The moringa *oleifera* Lam. biomass was characterized and then, it was possible to produce bio-oil from a thermochemical conversion of process in a fixed bed reactor at a temperature of 500 °C. The bio-oil presented composition different according with the characterization primary of the biomass.

## Agradecimentos

The CAPES for project financing.

[1] Titiloye, J. O.; Bakar, M. S. A. and Odetoye, T. E. *Industrial Crops and Products*. **2013**, *47*, 199.
[2] García, R.; Pizarro, C.; Lavín, A. G. and Bueno, J. L. *Bioresource Technology*. **2012**, *103*, 249.
3 Salaheldeen, M.; Aroua, M. K.; Mariod, A. A.; Cheng, S. F. and Abdelrahman, M. A. *Industrial Crops and Products*. **2014**, *61*, 49.
4 Sheng, C. and Azevedo, J. L. T. *Biomass and Energy*. **2005**, *28*, 499.
5 Shi, W.; Jia, J.; Gao, Y. and Zhao, Y. *Bioresource Technology*. **2013**, *146*, 355.