



**HAL**  
open science

## Hemp shiv extraction by process parameters simulation -An application in building engineering

Maya-Sétan Diakité, Hélène Lenormand, Vincent Lequart, Patrick Martin,  
Romain Roulard, Emmanuel Petit, Nathalie Leblanc

### ► To cite this version:

Maya-Sétan Diakité, Hélène Lenormand, Vincent Lequart, Patrick Martin, Romain Roulard, et al.. Hemp shiv extraction by process parameters simulation -An application in building engineering. The European Polysaccharide Network of Excellence (EPNOE), Oct 2021, Nantes (France), France. hal-04580760

**HAL Id: hal-04580760**

**<https://hal.science/hal-04580760>**

Submitted on 20 May 2024

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

# Hemp shiv extraction by process parameters simulation – An application in building engineering

Maya-Sétan DIAKITÉ<sup>a,b</sup>, Hélène LENORMAND<sup>b</sup>, Vincent LEQUART<sup>a</sup>, Patrick MARTIN<sup>a</sup>, Romain ROULARD<sup>c</sup>, Emmanuel PETIT<sup>c</sup>, Nathalie LEBLANC<sup>b</sup>

<sup>a</sup> Univ. Artois, UniLaSalle, ULR7519 - Unité Transformations & Agro-ressources, F-62400 Béthune, France.

<sup>b</sup> UniLaSalle, Univ. Artois, ULR7519 - Unité Transformations & Agro-ressources, Normandie Université, F-76130 Mont-Saint-Aignan, France.

<sup>c</sup> Unité Biologie des Plantes et Innovation, BioEcoAgro, Joint Research Unit / UMR transfrontalière 1158, Université de Picardie Jules Verne, F- 80025 Amiens, France.

[maya.diakite@unilasalle.fr](mailto:maya.diakite@unilasalle.fr); [helene.lenormand@unilasalle.fr](mailto:helene.lenormand@unilasalle.fr); [vincent.lequart@univ-artois.fr](mailto:vincent.lequart@univ-artois.fr);  
[patrick.martin@univ-artois.fr](mailto:patrick.martin@univ-artois.fr); [romain.roulard@u-picardie.fr](mailto:romain.roulard@u-picardie.fr); [emmanuel.petit@u-picardie.fr](mailto:emmanuel.petit@u-picardie.fr);  
[nathalie.leblanc@unilasalle.fr](mailto:nathalie.leblanc@unilasalle.fr)

The necessity of building materials improvement led to reconsider lignocellulosic biomass as a tool to upgrade materials characteristics (thermal and acoustical insulation, environmental impact, air quality...). Thus, current studies are focusing on plant valorization into materials like biobased mortars and particles boards. However, the invariability of synthetic building materials submitted to international standards compared to plant variability unsubmitted to these rules, need to be investigated to upgrade materials characteristics.

According to literature, molecules like sugars or polyphenols are highly released during processing methods. These molecules can contribute to delay rigidification in mortar [1;2] or can permit interactions between plant aggregates in binderless particles boards [3]

Thus, a better understanding of plant biomass and plant released molecules during process are required to get those mechanisms and by extension better add value products. In this way, this work will be focused on hemp shiv and split into three main parts;

- Plant cell wall composition has been investigated by Van Soest method [4] and sequential extraction.

- Process parameters simulation focus on pH and temperature have been carried out on hemp shiv to extract similar compounds released during bio-based materials production [1] (Table 1).

- These extractives, acid and neutral sugars have been measured [5] and High-Performance Anion Exchange Chromatography with Pulsed Amperometric detection (HPAEC-PAD) analysis was performed for dosing each sugar [6;7].

| Hemp shiv FEDORA17            |          |            |             |                 |                   |                                |                                  |
|-------------------------------|----------|------------|-------------|-----------------|-------------------|--------------------------------|----------------------------------|
| Process parameters simulation | Water RT | Water 50°C | Water 100°C | pH 12,5 NaOH RT | pH 12,5 NaOH 50°C | pH 12,5 Ca(OH) <sub>2</sub> RT | pH 12,5 Ca(OH) <sub>2</sub> 50°C |

**Table 1.** Extraction method of extractives compounds by process parameters simulation

This study proposes an improving materials formulation process by providing a better understanding of plant released molecules.

**Key-words:** Hemp – biomaterials - building - extractives - process – simulations

**Acknowledge:** Authors would like to acknowledge funds provided by CABBALR, GoLaSalle project and Normandie PhD School (NBISE).

[1] G. Delannoy, S. Marceau, P. Glé, E. Gourlay, M. Guéguen-Minerbe, D. Diafi, I. Nour, S. Amziane and F. Farcas, *Materials & Design*, 160:752-762, 2018.

[2] L. Wang, H. Lenormand, H. Zmamou, N. Leblanc, *Journal of renewable materials*. 7, 9, 903-913, 2019.

[3] T. Pintiaux, D. Viet, V. Vandenbossche, L. Rigal and A. Rouilly, *BioResources* 10 (1), 1915-1963, 2015.

[4] P.J. Van Soest and J. Robertson, *American Naturalist* 125:640-72, 1985.

[5] B.M. Van Den Hoogen, P.R. Van Weeren, M. Lopes-Cardozo, L.M.G. Van Golde, A. Barneveld and C.H.A. Van De Lest, *Analytical Biochemistry* 257:107-111, 1998.

[6] M. Monsigny, C. Petit and A. Roche, *Analytical Biochemistry*, 175:525-530,1988.

[7] G.B. Silva, M. Ionashiro, T.B. Carrara, A.C. Crivellari, M.A. Tiné, J. Prado, N.C. Carpita, M.S. Buckeridge, *Phytochemistry* 72:2352–2360, 2011.