



Coupled production of biogas and date-syrup via biorefinery concept using common date cultivar biomass (*Phoenix dactylifera* L.)

Nesrine Ben Yahmed, Hélène Carrère, Issam Smaali

► To cite this version:

Nesrine Ben Yahmed, Hélène Carrère, Issam Smaali. Coupled production of biogas and date-syrup via biorefinery concept using common date cultivar biomass (*Phoenix dactylifera* L.). 3rd International Conference on Bioresource Technology for Bioenergy, Bioproducts & Environmental Sustainability, May 2021, Online, France. 2021. hal-04123915

HAL Id: hal-04123915

<https://hal.science/hal-04123915>

Submitted on 9 Jun 2023

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.

Nesrine Ben Yahmed ^a, Hélène Carrere ^b, Issam Smaali ^a

^a Laboratoire LIP-MB INSAT, LR11ES24, Université de Carthage, INSAT-BP 676, Centre urbain nord, 1080 Carthage Cedex, Tunisie

^b INRAE, Univ Montpellier, LBE, Avenue des Etangs, 11100 Narbonne, France

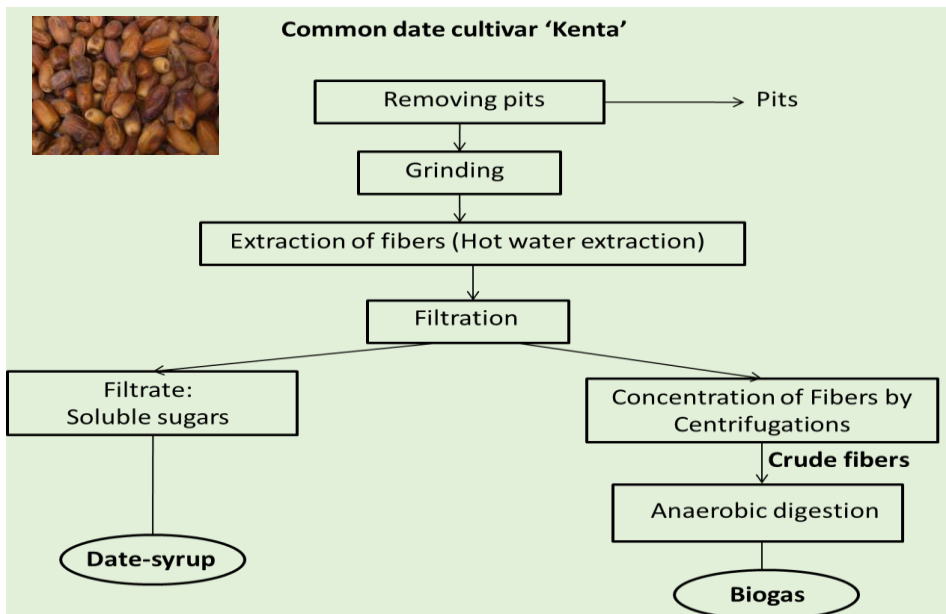
Introduction

Date production is usually associated with a considerable loss either in common cultivars such as 'Kenta' or in fruit picking and storage stages. This discarded biomass is not very well valued up to now especially in bioenergy production.

Objectives

- Biochemical characterization of Kenta flesh, fibers and date syrup.
- Development of a biorefinery concept based on the co-production of date-syrup and biogas.

Methodology



Results

Chemical composition of dates fleshes and extracted dietary fibers (DF)

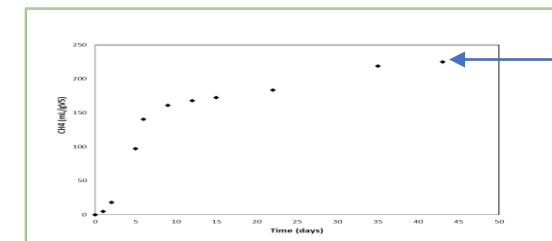
Composition	'Kenta' Flesh	'Kenta' Fibers
TS (%wet weight)	93.1 ± 0.2	90 ± 0.2
VS (%TS)	90.2 ± 0.2	70 ± 0.1
Total carbohydrates (%TS) ^a	79.5 ± 0.8	33.2 ± 0.7
Glucose (%TS)	27.4 ± 0.1	11.2 ± 0.5
Fructose (%TS)	28.1 ± 0.2	ND
Sucrose (%TS)	24 ± 0.4	ND
Xylose (%TS)	ND	16.9 ± 0.2
Arabinose (%TS)	ND	5.1 ± 0.4
Total fibers (%TS)	7.4 ± 0.5	-
Uronic acids (%TS)	ND	16.8 ± 0.4
Proteins (%TS) ^b	2.8 ± 0.1	8.8 ± 0.1
Lipids (%TS)	0.41 ± 0.02	ND

The biochemical composition analysis showed that Kenta fibers contain mainly carbohydrates (33.2 % VS ± 0.7%VS) and proteins (8.8% VS ± 0.1% VS) making it a suitable substrate for biogas production.

Development of a biorefinery concept based on soluble sugars extraction and biogas production

Component	'Kenta' syrup
Glucose (%TS)	22.6 ± 0.1
Fructose (%TS)	23.2 ± 0.2
Sucrose (%TS)	18.2 ± 0.4
Total carbohydrates (%TS)	64 ± 0.8

Date syrup:
High-added value product
with 0.6 g
sugars/gVS



225 mL
CH₄/gVS
fibers after
45 days of
anaerobic
digestion

Conclusion and perspectives

This study presents a proof of a sustainable biorefinery approach allowing a complete bioconversion of undervalued secondary date variety. Optimization of the process steps is necessary.

Contacts: nesrine.benyahmed@gmail.com / helene.carrere@inrae.fr / Issam.Smaali@insat.rnu.tn

Publication: Ben Yahmed et al, New sustainable bioconversion concept of date byproducts (*Phoenix dactylifera* L.) to biohydrogen, biogas and date-syrup, International Journal of Hydrogen Energy, Vol 46, Pages 297-305