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

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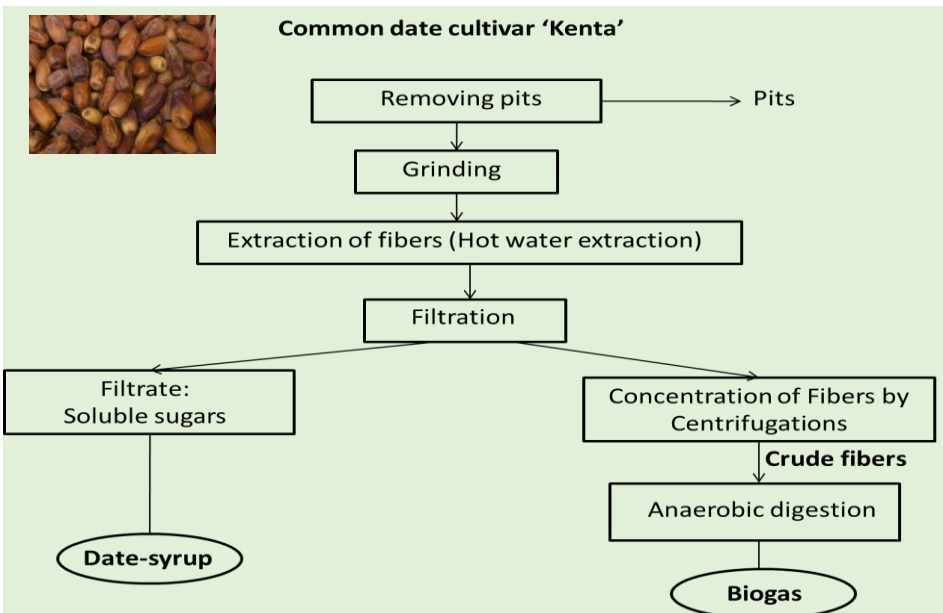
Introduction

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)

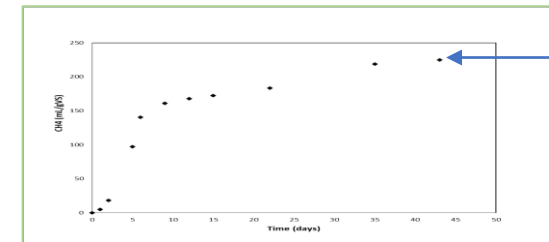
Composition	'Kenta' Flesh	'Kenta' Fibers
TS (%wet weight)	93.1 ± 0.2	90 ± 0.2
VS (%TS)	90.2 ± 0.2	70 ± 0.1
Total carbohydrates (%TS) ^a	79.5 ± 0.8	33.2 ± 0.7
Glucose (%TS)	27.4 ± 0.1	11.2 ± 0.5
Fructose (%TS)	28.1 ± 0.2	ND
Sucrose (%TS)	24 ± 0.4	ND
Xylose (%TS)	ND	16.9 ± 0.2
Arabinose (%TS)	ND	5.1 ± 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.

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