

# Evaluation of the sugar production from cellulosic rejections from wastewater treatment plants as valorisation strategy



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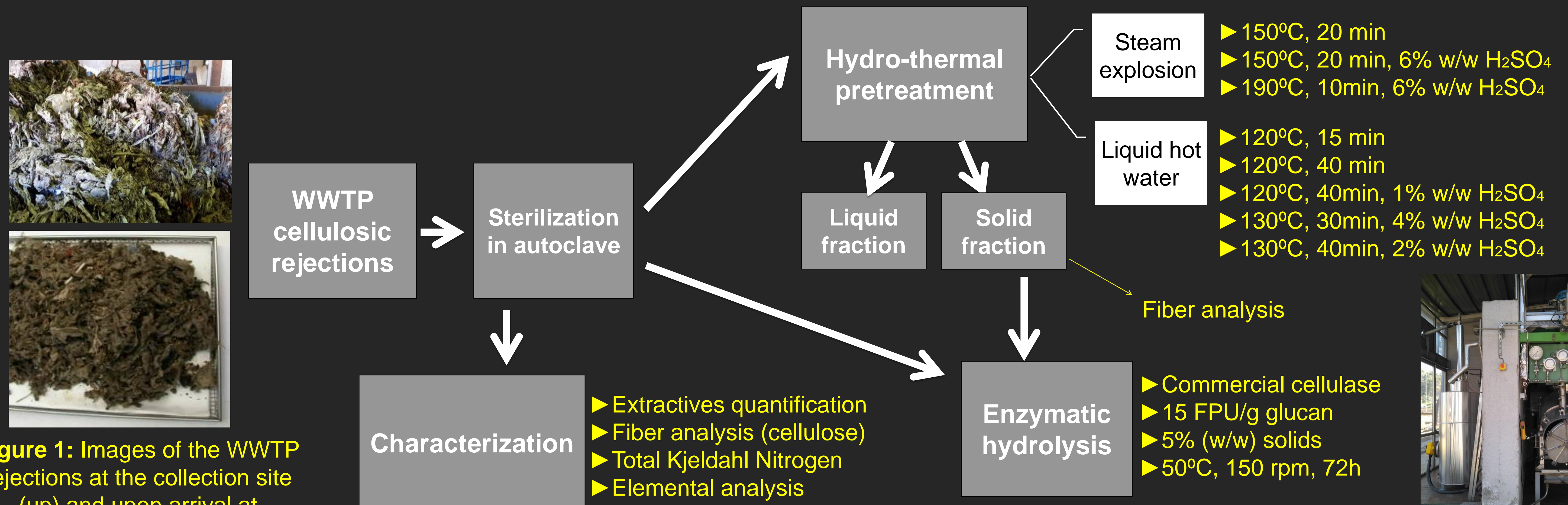
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## Introduction

Wet wipes, sanitary products and other inappropriate materials are flushed down the toilets on a regular basis and they end up causing problems in the sewer systems and the wastewater treatment plants (WWTP).

These wastes incur in costs for the communities and waste managing companies, and are currently not being valorised in any way. The present work proposes a way to valorise the cellulosic fraction contained in this type of substrates by a biochemical route.



**Figure 1:** Images of the WWTP rejections at the collection site (up) and upon arrival at CIEMAT's laboratories (down)



**Figure 2:** Steam explosion plant

## Results & Discussion

**Table 1:** Main components of WWTP cellulosic rejections in % dry weight basis (dwb)

Component	(% dwb)
Extractives	17.75 ± 1.17
Glucan	25.82 ± 0.50
Hemicellulose	4.65 ± 0.13
Acid insoluble residue	38.54 ± 0.88
Ash	7.55 ± 0.15
Total Kjeldahl Nitrogen	1.35 ± 0.03

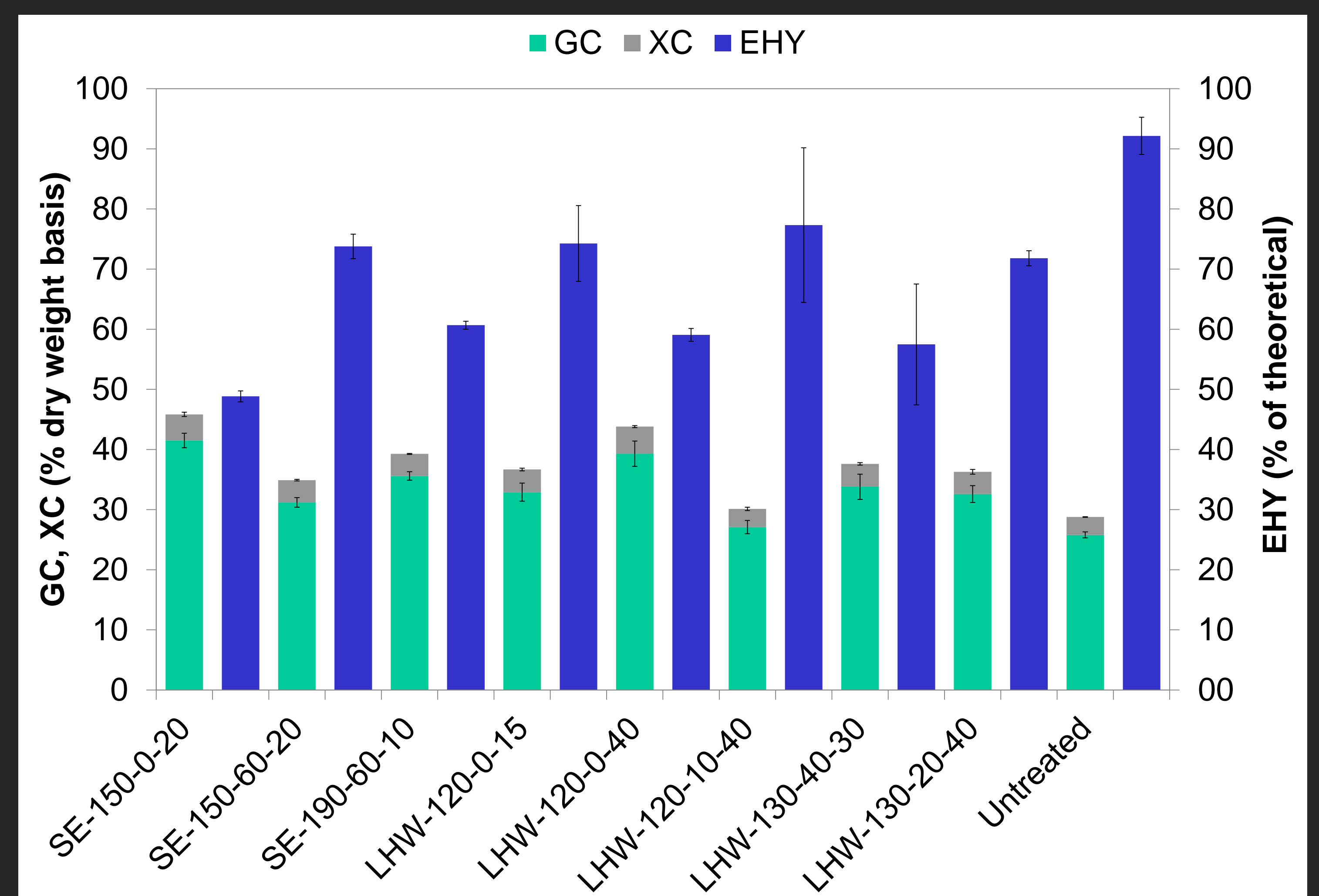
► The carbohydrate fraction of the cellulosic rejections from WWTP constitutes around 30% of the total dry weight of the residue, cellulose contributing to almost 90% of them.

**Table 2:** Elemental analysis of WWTP cellulosic rejections in % dry weight basis (dwb)

		(% dwb)
Ultimate analysis	C	55.1
	H	7.0
	O <sub>2</sub>	27.5
	N	1.32
	S	0.25
Inorganic elements	Cl	0.17
	Al	2.2
	Ca	22.0
	Fe	2.9
	K	2.2
	Mg	1.6
	Na	2.2
	P	3.3
	S	1.6
	Si	10.0
	Sr	6.4

► The ultimate analysis reveals significant deviation from the elemental composition of pure cellulose, indicating the presence of other organic polymers (synthetic fibres).

► Ca and Si are the main inorganic elements found in the ashes, which could correspond to soil and dirt dragged along with the nonwoven fibres.



**Figure 3:** results of glucan content (GC), xylan content (XC) in dry weight basis and enzymatic hydrolysis yield (EHY) calculated over the theoretical glucose and xylose determined in the waste

► For some conditions, there is a certain concentration of carbohydrates in the solid fraction after the pretreatment, more noticeable when no acid is added.

► The enzymatic hydrolysis yield of the untreated cellulosic rejections is very high and cannot be further improved by applying a hydrothermal pretreatment.

## Conclusions

More than 90% of the carbohydrate fraction contained in sterilized cellulosic rejections recovered from WWTP could be released in form of monomeric sugars by enzymatic hydrolysis with a commercial cellulolytic cocktail, without the need for a prior pretreatment.

**Acknowledgements:** This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 818308 (WaysTUP! project).

