CHARACTERISATION OF FIBERS FROM CARIBBEAN *SACCHARUM OFFICINARUM*

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Summary

I. Introduction to the plant

Saccharum Officinarum

II. Fiber extraction method

III. Characterization

IV. Results and discussion

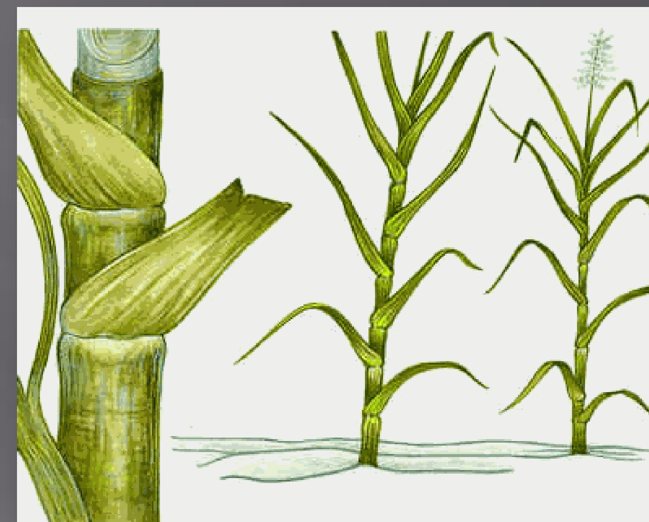
V. Conclusion

Introduction to the plant

- *Saccharum officinarum* from New guinea
- Family: Poaceae (graminae)
- Introduced in 1493

  in Caribbean islands by Cristobal Colon

- 12 months culture, in tropical area
- Climatic conditions
  - Sun
  - Water
  - Soil element



- World production
  - 1290 million tones of cane stalk
  - 413 million tones of bagasse
- Production Martinique
  - 202 ktons/year
    - 35% sugar mill *le Galion*
    - 65% alcohol mill (9x)

INTRODUCTION

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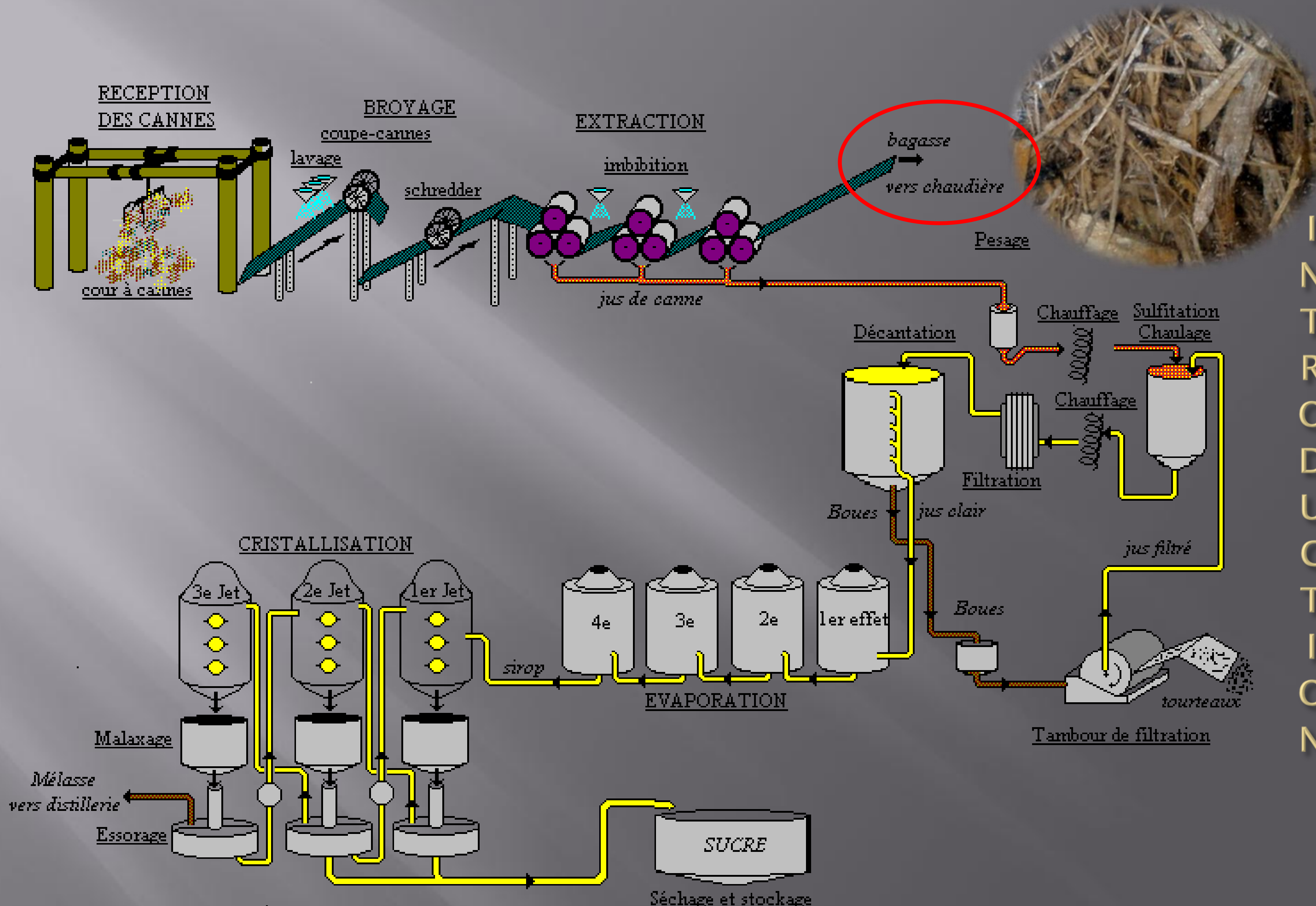


Common application of bagasse

✓Ciment-Bagasse planks and boards

✓Rayon

✓Panels

✓Paper for newspaper

✓Dietary packeging

✓Composites material

✓Combustible

Chemical composition of sugarcane

Components	Sugarcane	Bagasse
Cellulose	32-48%	43-45%
Hemicellulose	27-32%	25-27%
Lignin	19-24%	20-22%

***Solubility in hot water**	**6.2%**	**4.1%**
Ash	1.4%	2.6%

Extraction method of fibres

- MECANICAL EXTRACTION
- RETTING
- STEAM EXPLOSION
- STRIPPING
- ENZYMATIC
- KRAFT PROCESS

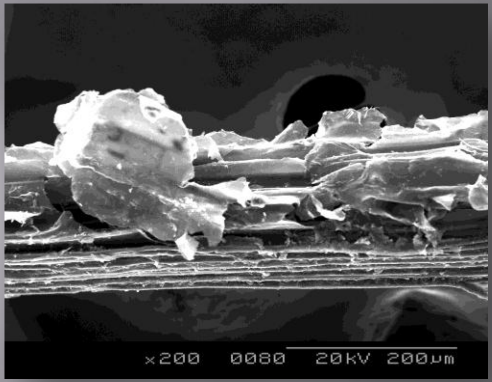
Extraction

Prehydrolysis → Alkaline cooking → Washing

	1N NaOH	0.1N NaOH
With prehydrolysis	β1	B2
WiThout prehydrolysis	β3	β4

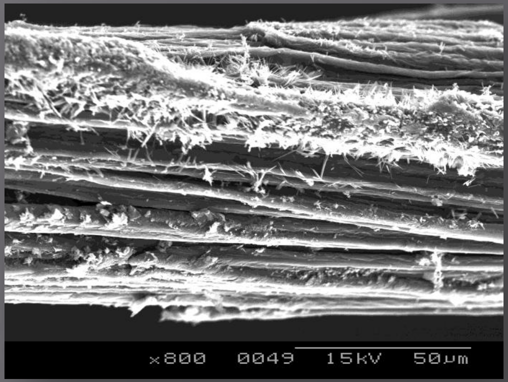
Results and Discussions

Bagasse from sugar mill

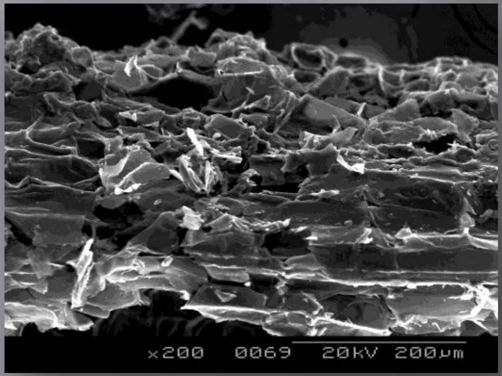


Prehydrolisis

NaOH 1N

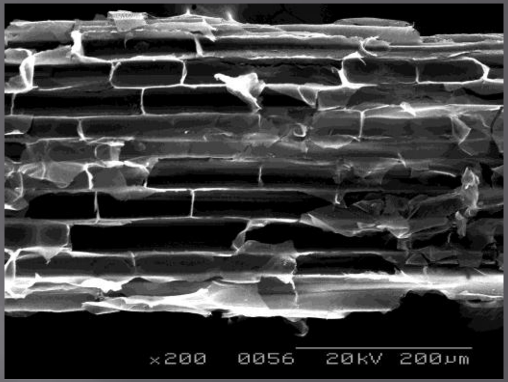


Crushed cane

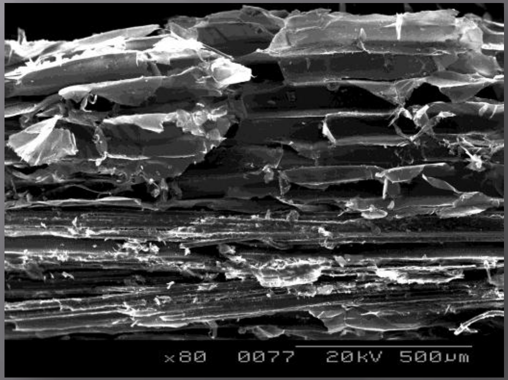


Prehydrolisis

NaOH 0.1N

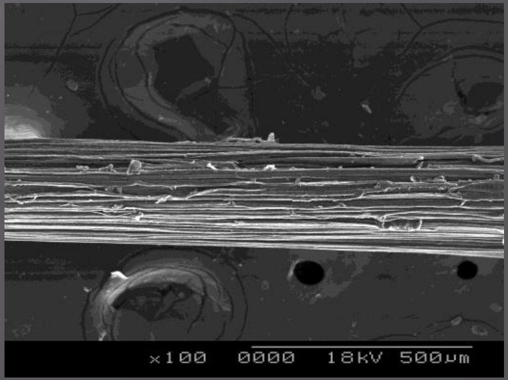


Rind cane



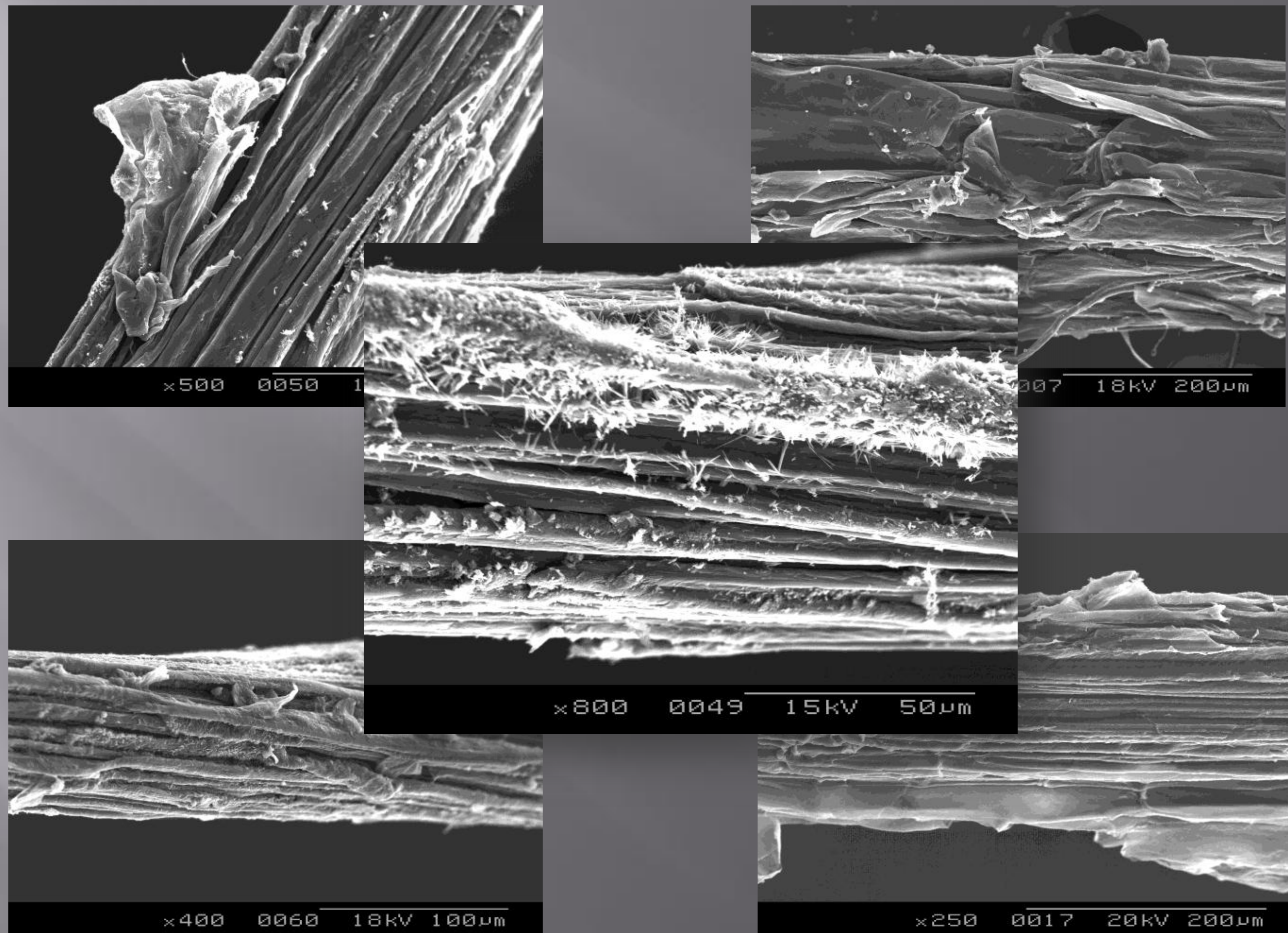
Prehydrolisis

NaOH 2N



Results and Discussions

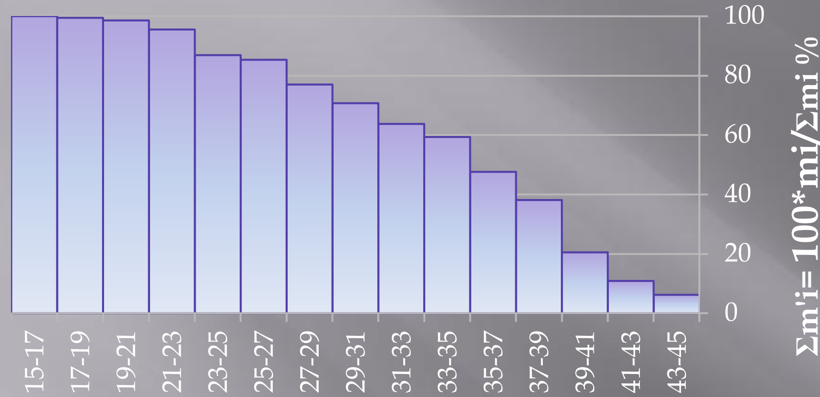
	1 N NaOH	0.1 N NaOH
With prehydrolysis	ß1	ß2
Without prehydrolysis	ß3	ß4



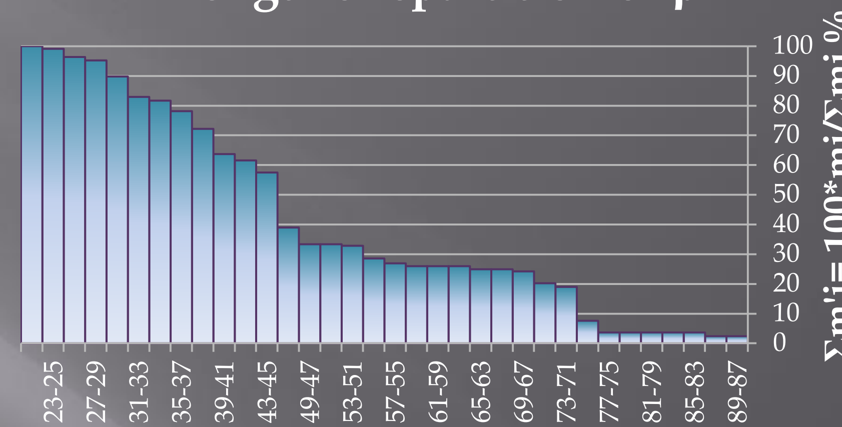
- The amount of lignin removed depends of the severity of the treatment

Fiber fineness

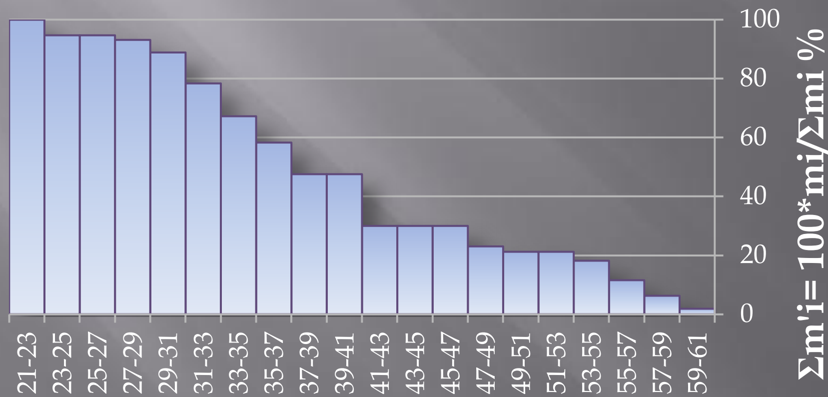
Length's repartition of β1



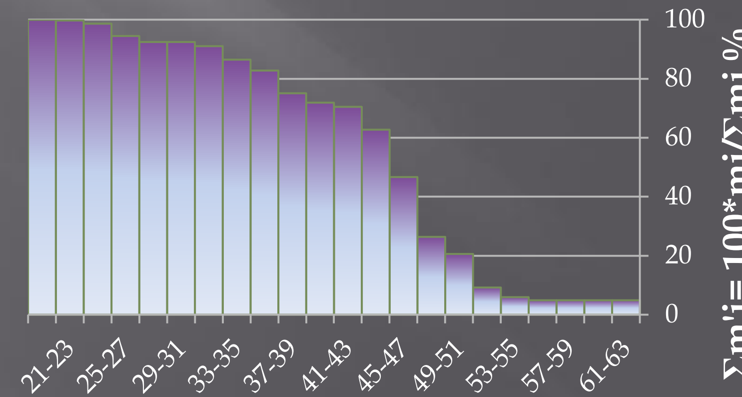
Length's repartition of β2



Length's repartition of β3



Length's repartition of β4

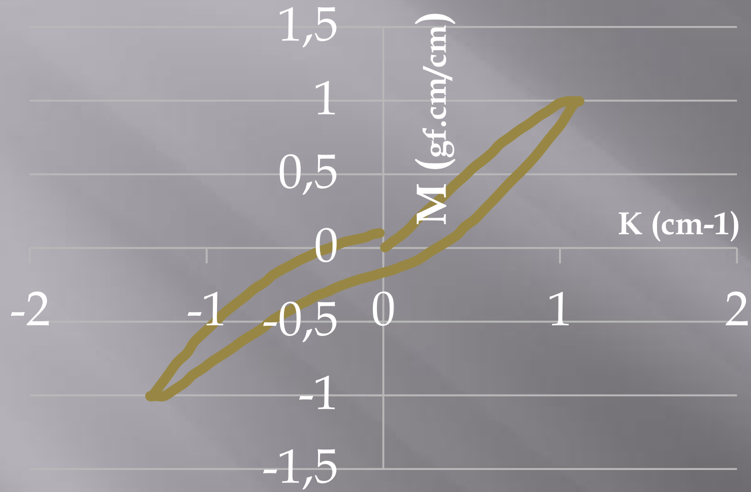


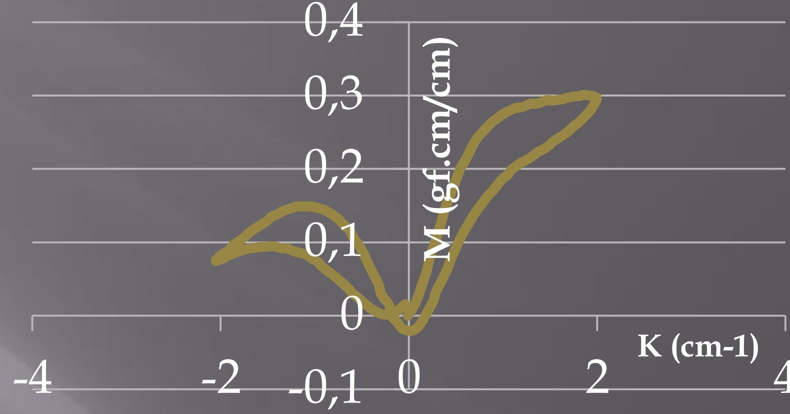
Fiber fineness

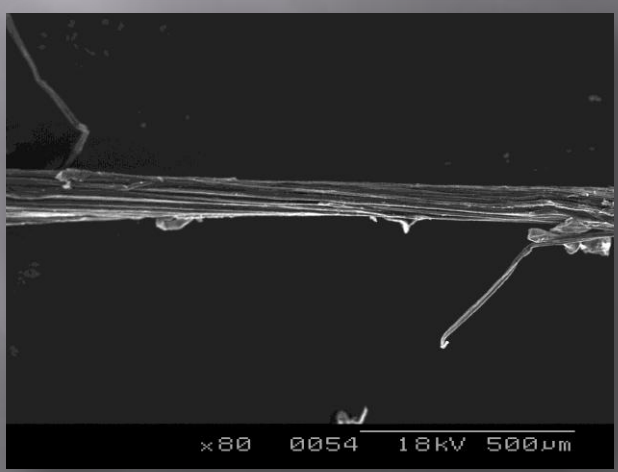
Bagasse fibres	Mean Length (mm)	Barbe (mm)	Hauteur (mm)	Linear density (tex)
β1 fibres	29.8	33.20	31.52	32.1
β2 fibres	45.6	47.88	42.66	38.7
β3 fibres	37.7	39.28	36.72	35.0
β4 fibres	37.6	42.93	40.89	49.0

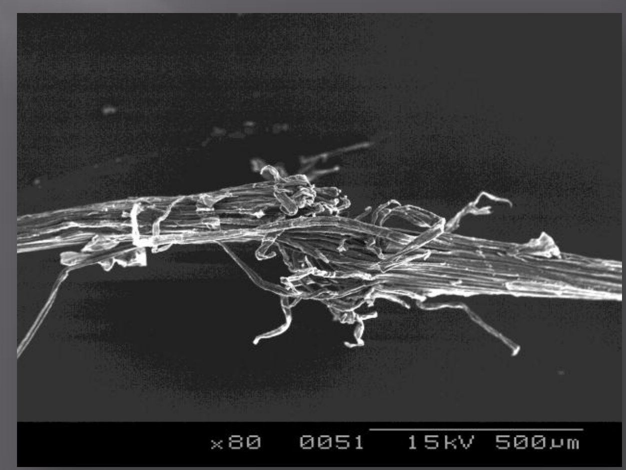
* **CV%** is over 50% for all treatments

Bending Rigidity









Bending Rigidity

Bagasse fibres	Mean Length (mm)	Bending rigidity gf.cm²/fiber bundle	Bending hysteresis gf.cm/fiber bundle	Linear density (tex)
β1 fibres	29.8	0.13	0.12	32.1
β2 fibres	45.6	0.45	0.18	38.7
β3 fibres	37.7	0.32	0.35	35.0
β4 fibres	37.6	-	-	49.0

Tensile properties

- As a function of the alkaline concentration

Bagasse fibres	Tenacity (cN/tex)	Extension to break (%)
β3 fibres	15.63	2.84
β4 fibres	18.13	3.13

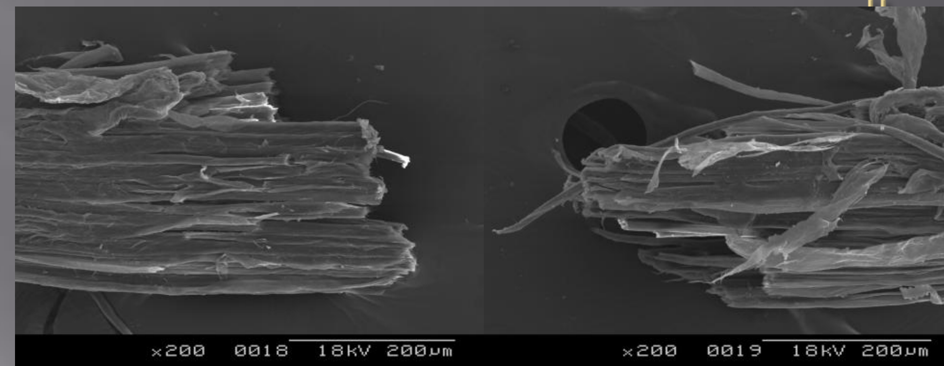
Initial Length 30mm

1 N NaOH

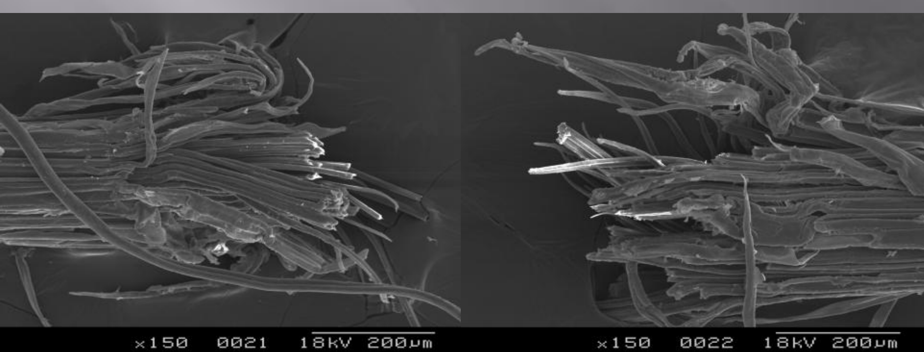
0.1 N NaOH

ß1

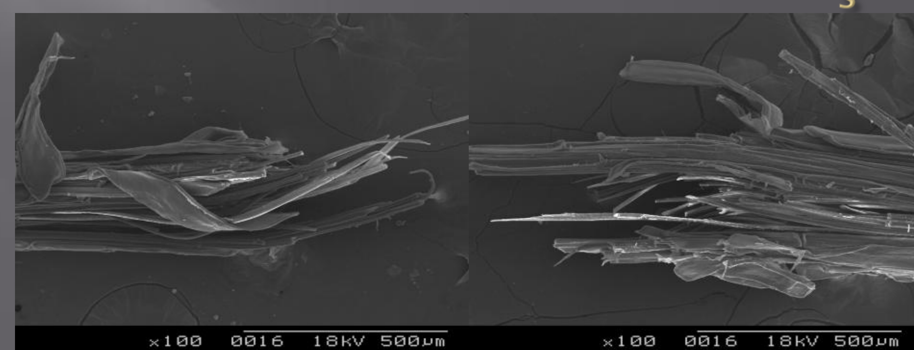
ß2



ß3



ß4



Yarn from sugarcane bagasse By classical spinning

Wet material

- 70% extracted bagasse fibers
- 30% cotton fiber

4000 Tex

80 Tex

Yarn from sugarcane bagasse

810 Tex

Conclusion and Perspectives

- EXTRACTION: Alkaline concentration most effective parameter
  affects the fiber fineness
  the content of lignin extraction

- Heterogenous fiber are obtained by chemical way despite a preselection -> fibers seam difficult to operate

- CHARACTERIZATION: optimize the measurement method

- APPLICATION: Classical spinning is not adapted
  - More extraction or spinning process have to be investigated to reach the cellulosic ultimate fibers

Thank you for your attention