Hemp fibres for the paper industry

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Sustainable paper revolution:

the use of hemp for a greener future

March 26th 2024

LUCENSE

RICERCA E SERVIZI PER L'INNOVAZIONE

Outline

1. Introduction of LUCENSE
2. Rationale and objectives of the research
3. Laboratory tests and results
4. Evaluations on industrial scale-up
5. Conclusions

No-profit consortium company established in 1984

Technology transfer and **innovation consultancy**

to local SMEs and Industries

LUCENSE – Centro Qualità Carta

Independent and accredited laboratory on cellulose based materials and products

ACCREDIA
LAB N.0074

Tests and analyses Conformity certificates Calibrations	Consultancy Experiments R&D	Technical training to enterprises

www.cqc.it

INNOPAPER and the paper industry sector

INNOPAPER – the technology cluster of Regione Toscana for the paper industry.

- **155 enterprises** and
- **22 research and competence centres**

innopaper
Distretto Tecnologico Cartario

Strategic focus on

- Sustainability and circular economy
- Smart manufacturing and Industry4.0
- Product and process innovation
- Education and training

8.000 employees

Turnover 4,5 billion (1,4 export)

75% and 40% of Italian production of tissue and packaging paper

The interest of paper making industry in alternative fibres

- The demand for cellulose is rising
- 100% of cellulose supply comes from Scandinavia or outside Europe
- Increasing need of ‘new fibres’ in substitution of low-quality ones, to preserve paper performances at lower grammage
- Possibility to create local production with lower complexity and impact technologies

Research activity at Centro Qualità Carta laboratory

Objective of the study: evaluate potential of hemp fibres **for packaging and tissue paper** production.

Focus on hemp fibres from two different extraction processes at semi-industrial and laboratory scale.

Experimental steps:

A. Microscope and chemical analyses
B. Fibres preparation: imbibition and pulping
C. Fibres refining and mixing
D. Production of laboratory paper hand-sheets
E. Paper characterisation and evaluation

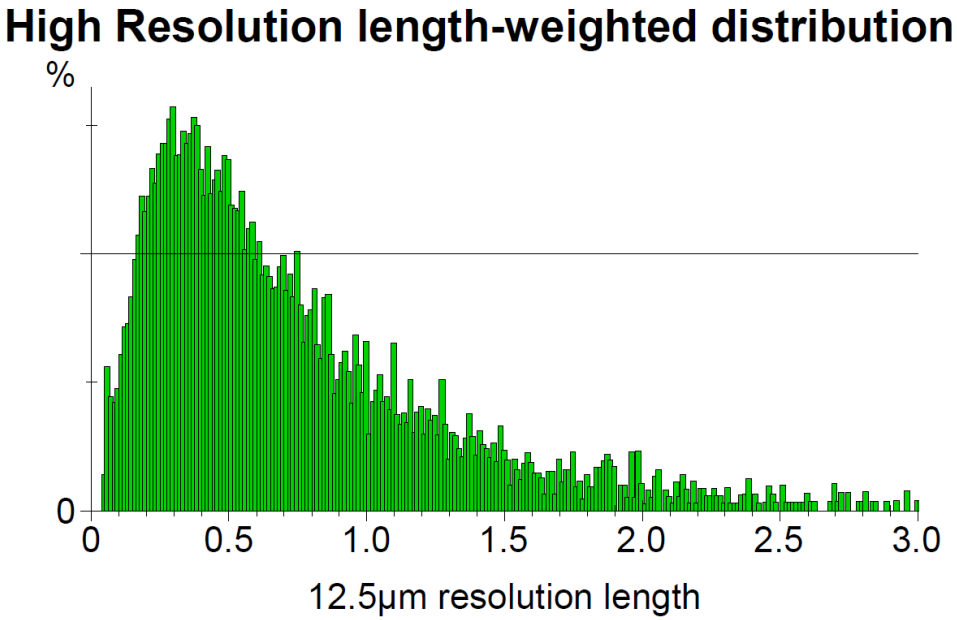
Laboratory tests: fibres preparation

- Fibres imbibition
- Pulping
- Screening
- Refining

Laboratory tests: fibres preparation

Valley refiner at low concentration till a high value of °SR (>60)

- Longer refining time: 40-60’
- FOAM formation
- Low residues
- Fiber length distribution (average 0.5-0.6 mm)



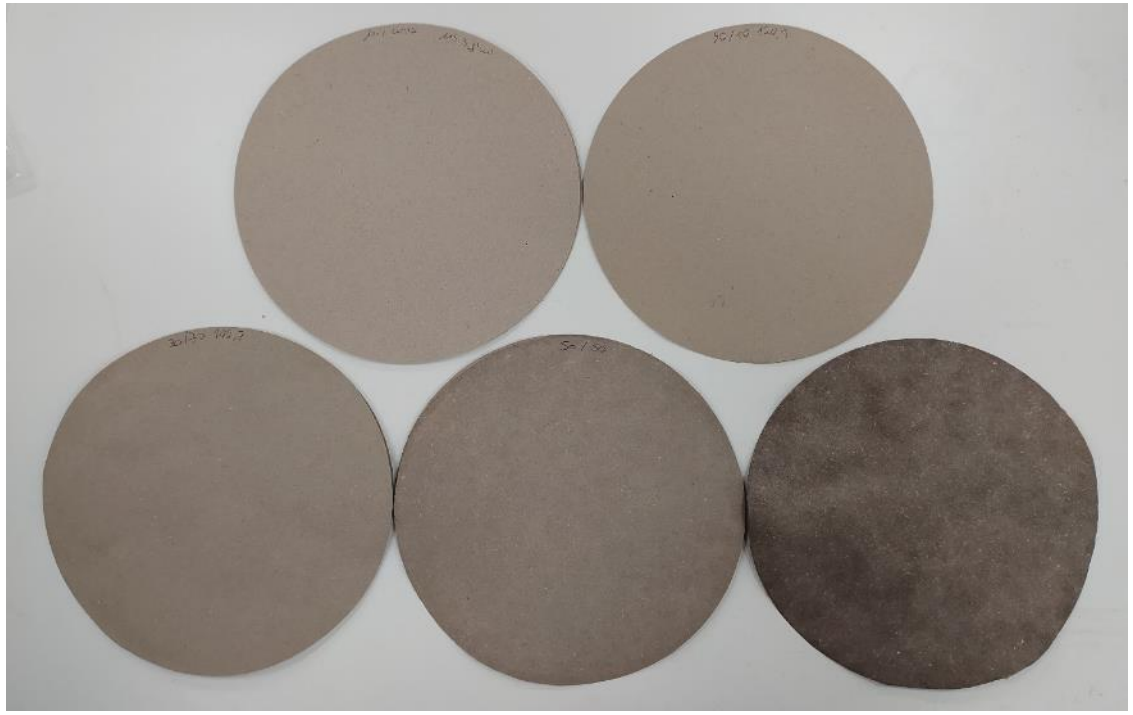
Comparative values:	ASH	LIGNIN
Pure cellulose:	1%	<1%
CTMP:	4%	20-35%
Fibre di Canapa:	**2%**	**10-20%**

Laboratory tests: paper hand-sheet preparation

Hemp fibres in mix at 10-30% with:

- paper for recycling for packaging application
- cellulose for tissue

Laboratory tests: paper hand-sheet characterisation

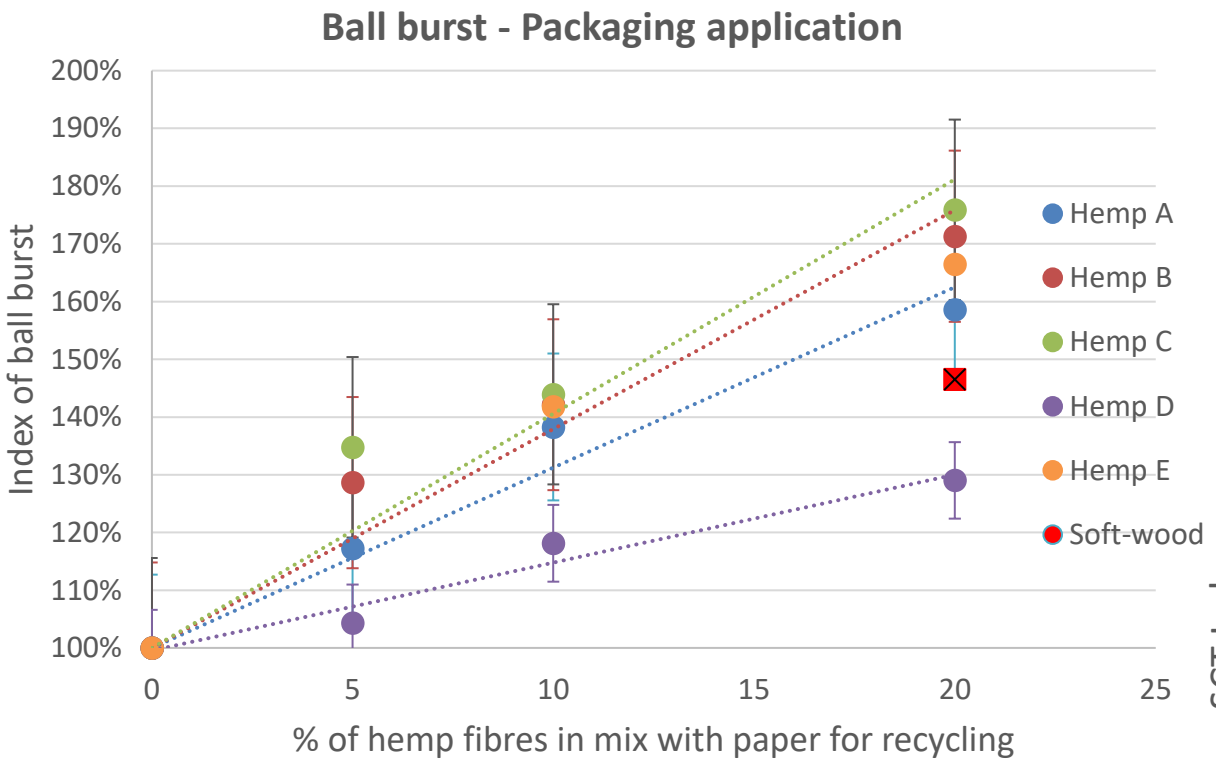


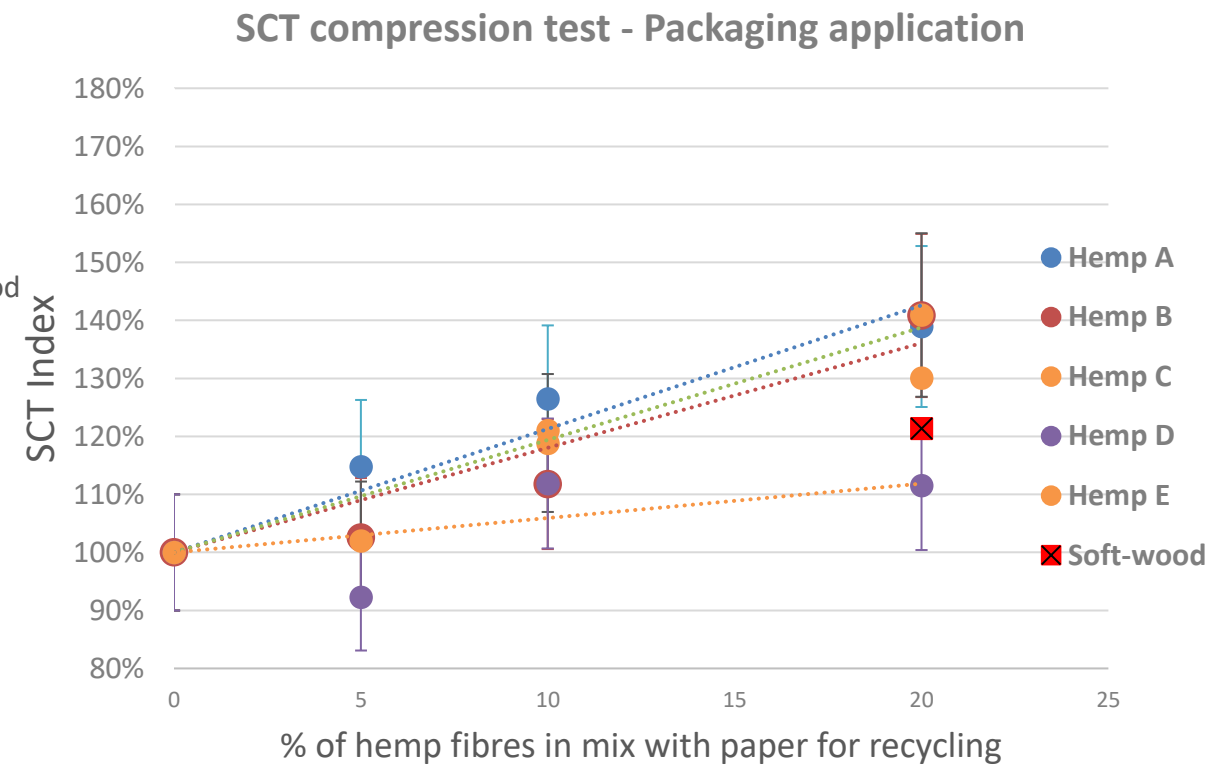
Physical-mechanical characterisation:

- Grammage
- **Tensile strength**
- Tear resistance
- **Compression strength SCT**
- Burst strength

Laboratory tests: paper hand-sheet characterisation

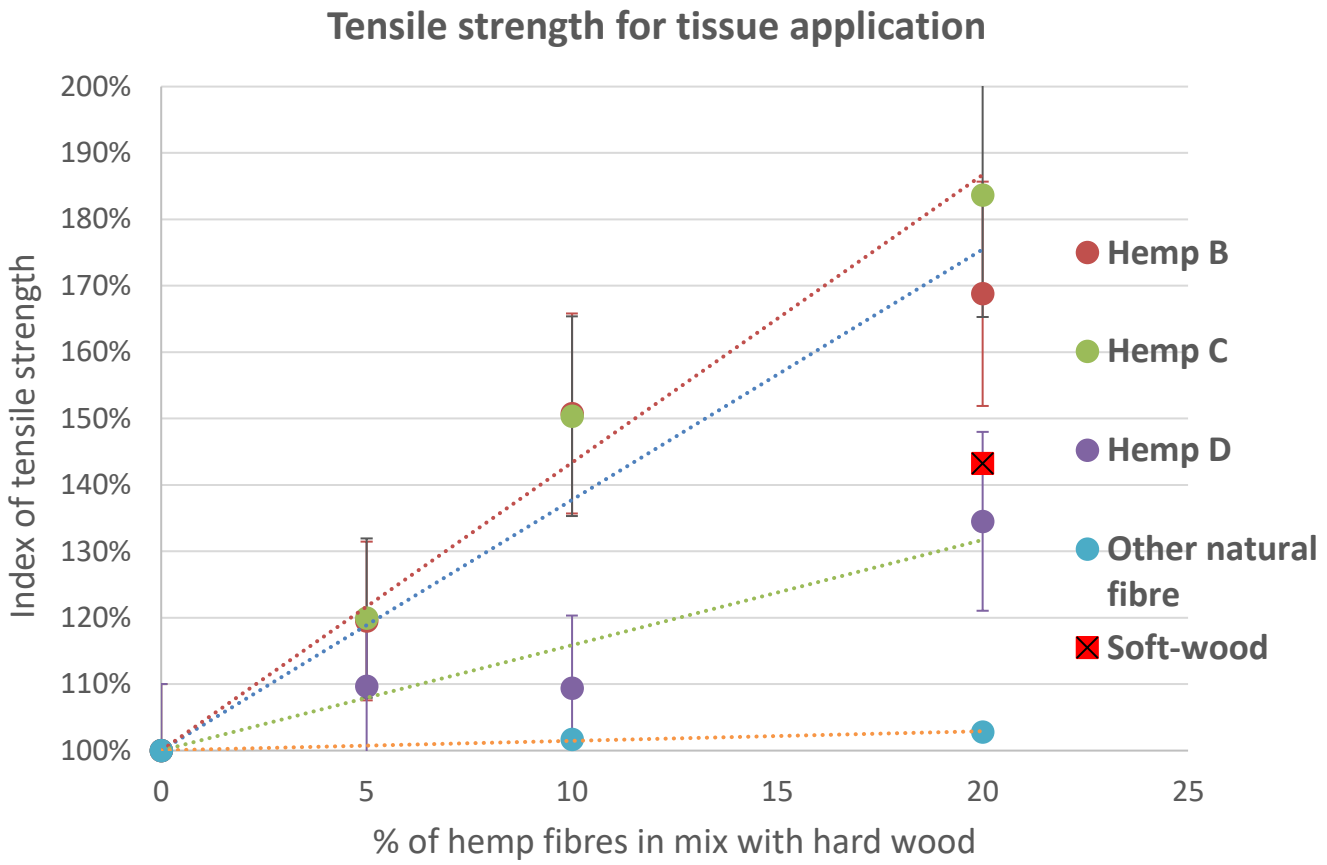
Packaging application





Laboratory tests: paper hand-sheet characterisation

Tissue application



Industrial scale-up

Evaluations for industrial scale-up

- Necessity for a dedicated pulp preparation line in the paper mill for pulping and refining
- Difficulties for fibres quality standardisation and necessity of adaptive refining
- Production costs
- Production volumes
- Concerns about logistics of hemp fibres, due to material low density and humidity

Conclusions

1. Good processability of hemp fibres at laboratory scale, with longer refining time as compared to cellulose and paper for recycling
2. Significant increase of paper's mechanical strengths, proportional to the amount of hemp fibres in the pulp mix with cellulose or recycled fibres
    - Packaging applications: potential for paper grammage or additives reduction
    - Tissue paper: potential alternative to soft wood
3. Issues concerning industrial scale-up, in terms of material standardisation, production/processing costs, quantities and logistics

Thanks for your attention!

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