

Valorization of lignin from sugarcane by-products: Review

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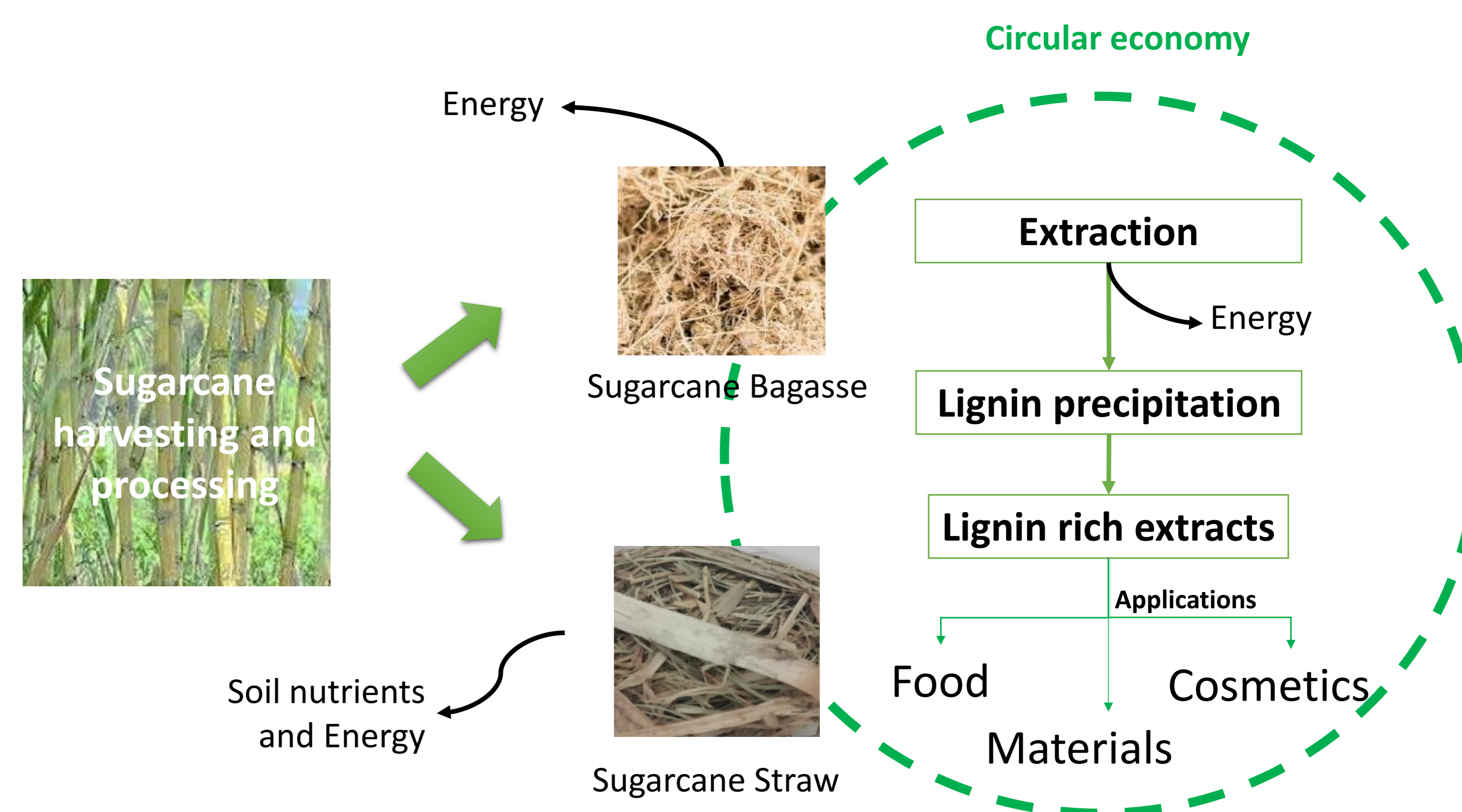
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Background

The valorization of sugarcane industry by-products is fundamental to increase competitiveness on a circular economy point of view. Straw and bagasse are by-products with huge potential as source of added value ingredients. Lignin is an abundant component found in these by-products with proved biological activity, particularly antimicrobial, antioxidant and UV protection. Additionally, recent applications on materials have been reported for lignin-based products.



Literature survey

Extraction processes

Main extraction / precipitation / drying conditions

Lignin extracts physico-chemical properties

Alkaline

1-7% sodium hydroxide; 80-130 °C; 2h or other
Liquid/solid ratio 20-50; in some studies H₂O₂ is added up to 2-4%;
Precipitation with mineral acids (HCl or H₂SO₄)
Oven drying at 40-60°C

92-96% lignin purity and 0.71-2.6% inorganics content; polydispersity 2.03-8.39 and 0.15-0.43 mmol/g of total hydroxyl groups

Organosolv

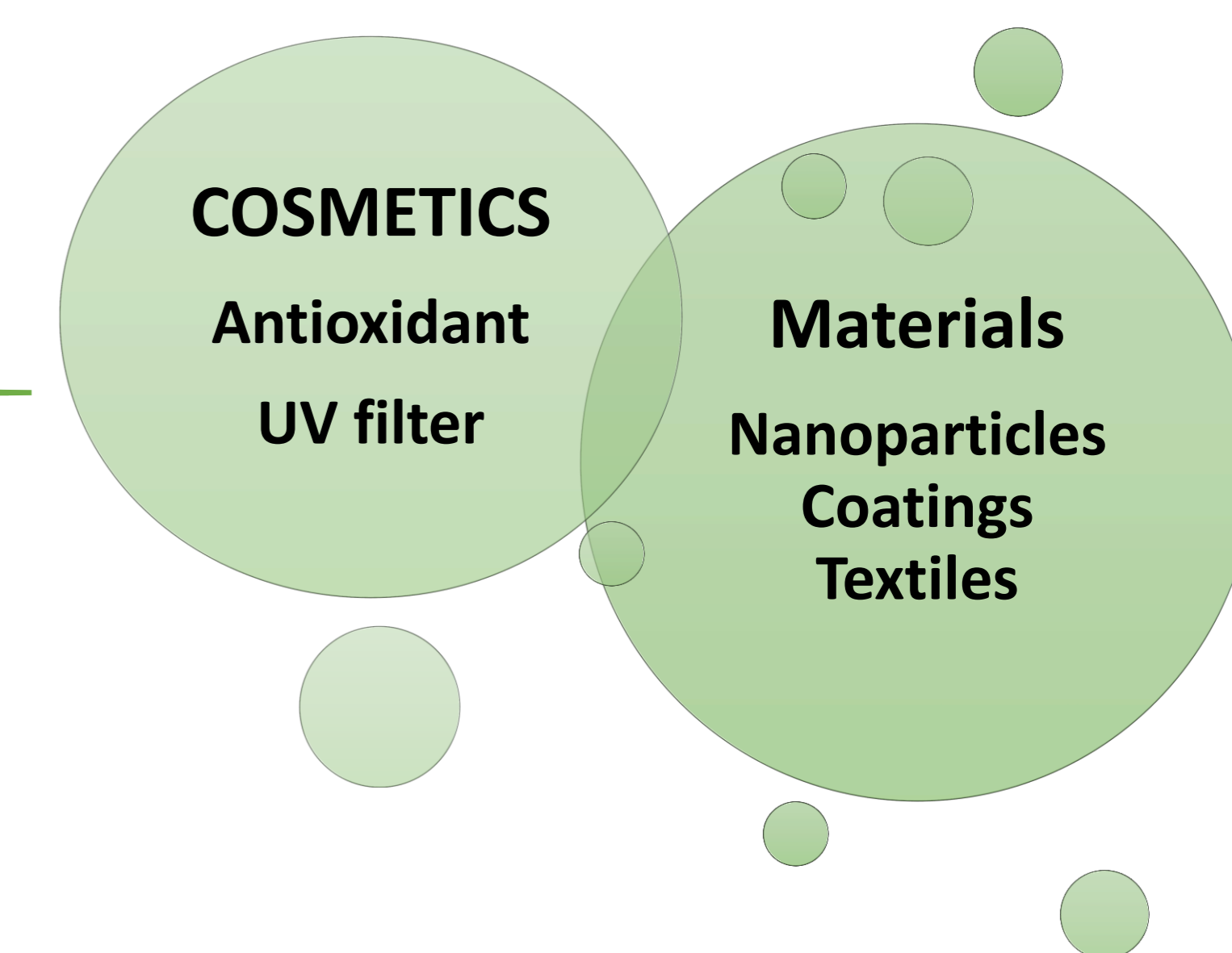
50-80 % aqueous organic solvent solution (e.g. ethanol, dioxane); acid or base –catalyzed; 20-30 bar; 85-190 °C, 0.75-4 h; Liquid-solid ratio of 10 or other;
Precipitation with water or acidified water
Oven drying at 40°C or freeze drying

In the majority of studies lignin characterization was not specified. When mentioned, the main properties were: 95% lignin purity and 0.92% inorganics content; polydispersity 2.51 and 0.60-0.75 mmol/g of total hydroxyl groups

Green solvents

Only one studies was found employing ionic liquid extraction carried out at 140°C, 120 min, liquid-solid ratio of 20; afterwards, the solid is mixed in acetone /water, filtered and the permeate recovered, vacuum filtered in order to obtain an enriched lignin fraction.

Polydispersity 1.61; Lignin characterization was not specified for the remaining properties



Conclusions and Future Perspectives

- Sugarcane bagasse and sugarcane straw possess distinct chemical properties.
- The source and pretreatment selection strongly influence sugarcane lignin applications.
- The most studied applications for sugarcane lignin are in cosmetics and materials, but the potential for other areas is tremendous. Clearly, further work is necessary on this subject.

References

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