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VALORIZATION OF EUCALYPTUS MILL´S RESIDUES FOR THE PRODUCTION OF XYLOSACCHARIDES, NANOCELLULOSE AND WOOD ADHESIVES.

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Uruguay has several commitments regarding its position in the bioeconomy and circular economy sectors, and strategic plans have been developed to maintain and enhance the country's positive reputation. The circular utilization of forest products is a key objective due to the significant role of the forest sector in the country's economy.

This work summarizes the results obtained in a research project where a two-step fractionation of eucalyptus wood residues (glucan: 48 ± 4%; lignin: 30.0 ± 0.6%; xylan: 14.3 ± 0.8%; acetyl groups: 3.8 ± 0.4%; and water-ethanol extractives: 4.6 ± 0.5%) was performed to produce value-added products.

To achieve this, an autohydrolysis step was applied to separate a liquid fraction rich in xylo-oligosaccharides (XOS). An experimental design was conducted with temperature (160-170 °C) and P-factor (300-500) as the main parameters, and the content and molecular weight distribution of xylosaccharides (XS) and XOS were the primary responses studied. The XOS-rich fraction was purified by resin treatment, analyzing the performance of different adsorption resins (Amberlite® XAD-4, XAD-7, and XAD-1180) and weak anionic resins (Dowex® 66, Diaion® WA30, and Amberlite® IRA-67). Once the best resin treatment was selected, the prebiotic effect of the raw and purified XOS-rich liquor was studied using *Lactobacillus rhamnosus* B-445.

An NaOH alkaline treatment (155°C, 60 min, 18% NaOH) was performed on the autohydrolysis spent solid to solubilize the lignin fraction and obtain a cellulose-rich solid fraction. Lignin was separated by sulfuric acid precipitation and, after characterization, was used in the formulation of wood adhesives. The solid fraction underwent enzymatic treatment (Novozymes Cellic CTec3 and HTec) followed by ball milling for nanocellulose fibers production.

The complete utilization of the different components for the production of value-added products demonstrates a simple scheme capable of rapid scalability.