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Chemical composition of *Ruscus aculeatus L.* – Preliminary studies

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Lignocellulosic material has gained considerable attention for presenting several environmental advantages due to its abundance, low price, renewable nature and low energy consumption in production. Nowadays, with a growing environmental awareness, the reassessment of agroforestry residues is one of the challenges of sustainable agriculture to reduce its environmental impacts and give them high added value[1].
The *Ruscus aculeatus L.* plant belongs to the *Liliaceae* family[2]. *Ruscus aculeatus L.* is a sub-shrub with a wide geographic distribution, occurring in more than 700 locations in mainland Portugal. Its high ecological plasticity allows it to colonize different types of habitat, although it shows a preference for forest environments dominated by oak forests. It grows on all types of soil from sea level up to 1400 meters, preferring shaded places with fresh and deep soils[3]. In the *Ruscus aculeatus L*. what appears to be leaves are actually expansions of the stem, called cladodes. It is in these formations that the flowers emerge and the fruits are formed, red globose berries when ripe. It presents pharmacological properties due to the presence of different classes of natural products or active compounds. *Ruscus aculeatus L*. is one of the most used plants in traditional medicine in different parts of the world, namely in Europe and the Iberian Peninsula[4].
The present study aimed to contribute to the development of scientific knowledge regarding the chemical composition of *Ruscus aculeatus L*. for a better understanding of the possible value-added products that can be obtained from this material. For this, the *Ruscus aculeatus L*. samples were characterized for their ash content, extractives (in dichloromethane, ethanol, and hot water), α-cellulose, lignin, and hemicelluloses. The 40–60 mesh fraction was used and prepared for the chemical analyses according to Tappi T 264 om-97. The ash content was determined by the calcination of the material at 525 ºC according to the standard procedure Tappi T 211 om-93. The extractives were determined by extraction with different solvents in sequential order of ascending polarity. The extractive content consisted on the determination of dichloromethane, ethanol, and hot water extractives using Soxhlet extraction according to Tappi T 204 om-88. The lignin content in *Ruscus aculeatus L*. free of extractives was determined by the Klason method with 72% H_2SO_4 (according to Tappi T 204 om-88). The soluble lignin was analyzed through spectrophotometry by measuring the absorption at 205 nm. Holocellulose was determined by the acid chloride method. The hemicellulose content was determined by the difference between holocellulose and α-cellulose.
Preliminary studies on chemical composition revealed that the material is lignocellulosic, presenting approximately 39,3% α-cellulose, followed by hemicellulose 21,2% and lignin 20,8%. However, analyses show a high percentage of hot water extractives of around 7,9%, higher than the extractives in ethanol (6,9%) and dichloromethane (2,1%). In this way, it can be concluded, based on the chemical characterization performed on *Ruscus aculeatus L*., that this material has several components of interest to recover. Additionally, because it is a lignocellulosic material it can also be transformed into a liquefied material that can be further processed to obtain a possible replacement for the polyol in polyurethane foams or that can be used to produce adhesives.

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References

1. F. J. Lozano and R. Lozano, Journal of Cleaner Production, 2018, 172, 4162–4169.
2. J. P. B. Rodrigues, Â. Fernandes, M. I. Dias, C. Pereira, T. C. S. P. Pires, R. C. Calhelha, A. M. Carvalho, I. C. F. R. Ferreira and L. Barros, *Molecules*, 2021, **26**, 1882.
3. Flora-On | Flora de Portugal, https://flora-on.pt/?q=Ruscus, (accessed 22 June 2023).
4. M. Masullo, C. Pizza and S. Piacente, *Planta Med*, 2016, **82**, 1513–1524.