

Circular beauty: from cork industrial waste to cosmetic ingredients

Sandra Mota a,b, Ana Torres a,b, Liliana Rego a,b, José Paulo Silva a,b, Joana Rocha e Silva c, Carlos Oliveira c, Dimas Alves c, Helena N. Ferreira b,d, Agostinho Almeida e, José Manuel Sousa Lobo a,b, Isabel F. Almeida a,b

a. UCIBIO – Applied Molecular Biosciences Unit, MedTech, Laboratory of Pharmaceutical Technology, Department of Drug Sciences, Faculty of Pharmacy, University of Porto, Porto, Portugal, up201608486@up.pt;

b. Associate Laboratory i4HB – Institute for Health and Bioeconomy, Faculty of Pharmacy, University of Porto, Porto, Portugal;

c. Dimas & Silva, Lda., Mozelos, Portugal;

d. UCIBIO–Applied Molecular Biosciences Unit, REQUIMTE, Laboratory of Microbiology, Department of Biological Sciences, Faculty of Pharmacy, University of Porto, Porto, Portugal;

e. LAQV/REQUIMTE, Laboratory of Applied Chemistry, Department of Chemical Sciences, Faculty of Pharmacy, University of Porto, Porto, Portugal

Currently, consumer demand for more sustainable products is driving the cosmetics industry to explore eco-friendly ways to source cosmetic ingredients, such as upcycling ingredients. There are several studies on the valorization of agro-industrial waste, but research on cork by-products is still very limited. This work aims to characterize cork industry by-products and explore their applicability as cosmetic ingredients. Moisture content, particle size, apparent density, colour, pH, flow properties, cake strength, heavy metal content and microbiological quality were analyzed for two cork by-products: coarse (P0) and fine cork powder (P1). The batch reproducibility was evaluated by comparing the properties of P0 and P1 obtained in different days. In addition, the *in vitro* Sun Protection Factor (SPF) boosting effect and the oil absorption capacity were determined to characterize their potential as cosmetic ingredients. P1 powder showed lower moisture content, apparent density and particle size, and a lighter colour than P0 powder. The heavy metal content was below the maximum limits defined by the EC Regulation 1223/2009 and the variability of the different batches was less than 15%. Although no pathogenic microorganisms were identified, the total aerobic microbe count was slightly above the maximum microbiological limits defined in the notes of guidance for the safety evaluation of cosmetic ingredients. Powders can be easily compacted, showing suitable cake strength. The SPF of the semi-solid formulations containing P1 combined with titanium dioxide (TiO₂) was higher than the control (TiO₂) while the oil absorption value of P1 was about 3 times greater than the control (kaolin). The results suggest that cork powders have interesting properties to be used as cosmetic ingredients, namely in sunscreens, compact foundations and mattifying products. The insight obtained in this work will also be useful to support the optimization of the industrial manufacturing process to improve the physicochemical and microbiological quality of cork by-products.

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