Bioactivity and Sensory Evaluation of Portuguese essential oils obtained from logging residues and thinnings

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Poster ID 394

Introduction:

Landscaping of *Eucalyptus globulus*, *Pinus pinaster*, *Pinus pinea* and *Cryptomeria japonica* forest provide logging residues that can be used to extract essential oils (EOs).

In cosmetic industry consumers have a growing interest in substances of natural origin

EOs

EOs can result from forest biomass. Sustainability relevance of reusing forest biomass to obtain value-added product

Biological properties and pleasant scents

AIMS: Evaluation, in a context of sustainability, of the bioactivities of *Eucalyptus globulus*, *Pinus pinaster*, *Pinus pinea* and *Cryptomeria japonica* EOs, **Table 1**, obtained from biomass wastes resulting from Portuguese forest maintenance, and identification of sensory properties, **Table 2**, and their acceptability in skin care emulsions.

Materials & Methods:

Local producers supplied eleven EOs samples. The EOs were analysed by gas chromatography and by gas chromatography associated with mass spectrometry [1]. The antioxidant and antimicrobial EOs activities were evaluated as shown in **Figure 1.** Sensory double-blind evaluation was performed as shown in **Figure 2.**

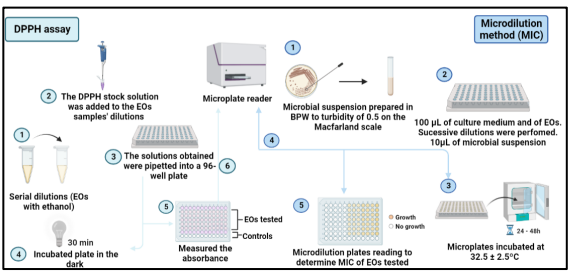

Figure 1. Representative scheme of DPPH assay and microdilution method.

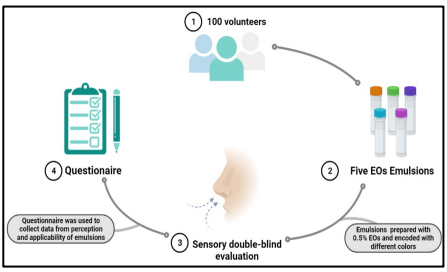

Figure 2. Representative scheme of sensory double-blind evaluation

Results & Discussion:

Table 1. Minimum inhibitory concentrations (MICs) of *Eucalyptus globulus*, *Pinus pinaster*, *Pinus pinea* and *Cryptomeria japonica* essential oils (EOs) against Gram-positive and Gram-negative bacteria and yeast.

EOs samples	DPPH	MICs				
		S.a	B.s	P.a	E.c	C.a
Eg_OE_1_G	198 ± 20	125	31	500	16	8
Eg_OE_2_B	647 ± 6	125	31	500	4	4
Eg_OE_3_O	152 ± 0	63	15	31	16	31
Eg_OE_4_E	WA	125	15	500	63	31
Eg_OE_5_P	WA	63	2	500	4	4
Eg_OE_6_S	247 ± 25	63	16	500	16	8
Pp_OE_1_G	55 ± 1	>500	>500	>500	>500	>500
Pp_OE_2_P	WA	31	16	500	16	63
Pp_OE_3_S	WA	>500	16	>500	125	125
Ppi_OE_1_B	196 ± 23	63	8	>500	125	16
Cj_OE_1_M	23 ± 0	>500	>500	>500	>500	>500

S.a: *Staphylococcus aureus* ATCC 6538. B.s: *Bacillus subtilis* ATCC 6633. P.a: *Pseudomonas aeruginosa* ATCC 9027. E.c: *Escherichia coli* ATCC 8739. C.a: *Candida albicans* ATCC 10231.

Table 2. Participants responses regarding the characterization of emulsions odor.

Emulsions' Odor	N (%)				
Classification of odors	Cj_OE_1_M	Ppi_OE_1_B	Eg_OE_1_G	Pp_OE_1_G	Pp_OE_2_P
1. Very unpleasant	0	9	36	4	5
2. Unpleasant	22	25	27	41	44
3. Pleasant and hot odor	15	12	15	10	13
4. Pleasant and fresh odor	60	53	22	30	27

Cj_OE_1_M: *Cryptomeria japonica.* Ppi_OE_1_B: *Pinus pinea.* Eg_OE_1_G: *Eucalyptus globulus.* Pp_OE_1_G: *Pinus pinaster.* Pp_OE_2_P: *Pinus pinaster.*

The odors from *C. japonica* and *P. pinea* EOs emulsions were considered the most pleasant and appreciated by majority of volunteers (**Table 2**).

The volunteers showed a preference for fresher and citrus smelling EOs emulsions, characterized by α-pinene and limonene presence rather than EOs emulsions with more intense and stronger 1,8-cineole odour [2].

C. japonica EO showed the highest antioxidant activity while *E. globulus* EO revealed the greatest efficacy against the selected strains, both showing relevant antioxidant activity and promising antimicrobial activity, which can be a key benefit justified by their promising skin health properties (**Table 1**).

Conclusions:

It is possible to conclude from these results that EO's studied have relevant antioxidant activity and promising antimicrobial activity, which can be a key benefit justified by their promising skin health properties. These natural-based EOs address the demand for sustainable and responsibly sourced odor accepted by consumers.

References:

[1] A. Neves, et al. Flavour and Fragrance Journal, 32 (2017) 392-402.
[2] A. Ruas, et al. Molecules, 27 (2022) 3572.

Acknowledgements:

Funded by the Fundação para a Ciência e Tecnologia, to CESAM UIDP/50017/2020+UIDB/50017/2020+LA/P/0094/2020, UIDB/04138/2020 and UIDP/04138/2020 to iMed.ULisboa, CEECINST/00145/2018 to J.Marto.