

## Characterization of the photo-protective ability of *Cyclopia spp.* (Honeybush) extracts as new UV filters for skin protection

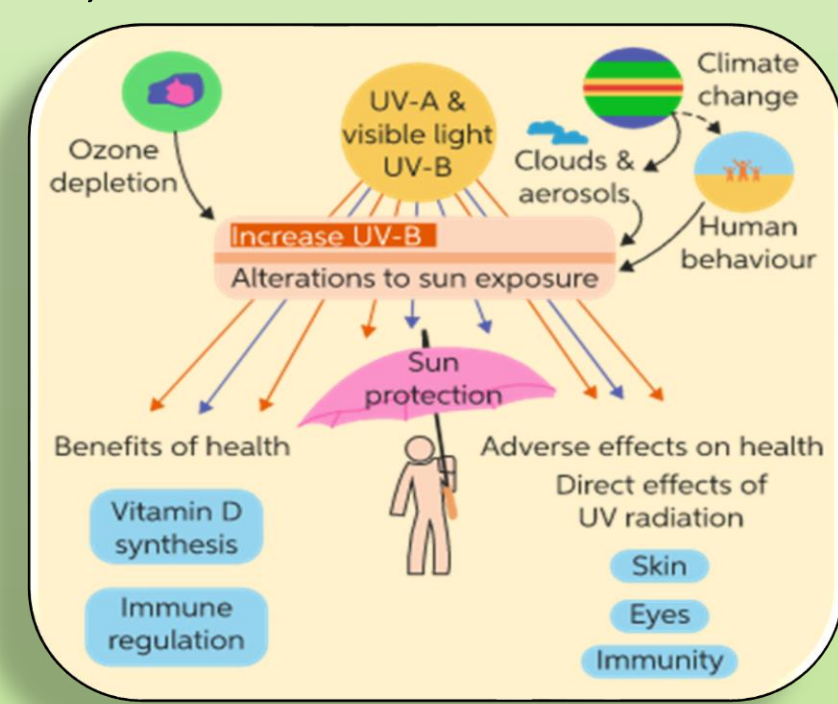
PhD student: Alessia Luccarini - Tutor: Elisabetta Damiani  
 Laboratory of Food Biochemistry, Nutrition and Oxidative Stress

### Introduction

Skin photoaging is premature aging of the skin caused by repeated exposure to ultraviolet (UV) rays. UVA radiation induces a range of physiological photoaging reactions, including chronic inflammatory signaling, dermal matrix degradation, solar elastosis and alteration of tissue homeostasis (1).

Among the various defense measures adopted to reduce the damage induced by overexposure to sunlight, the most common is the use of sunscreens, that shield from UVR due to the presence of chemical and/or physical UV filters.

However, it has been reported that some of them may lead to adverse effects (2). Several ingredients extracted from natural plant sources are now commonly used in cosmetics, and there is an increasing tendency of introducing advanced environmentally-friendly products in the cosmetic market (3).

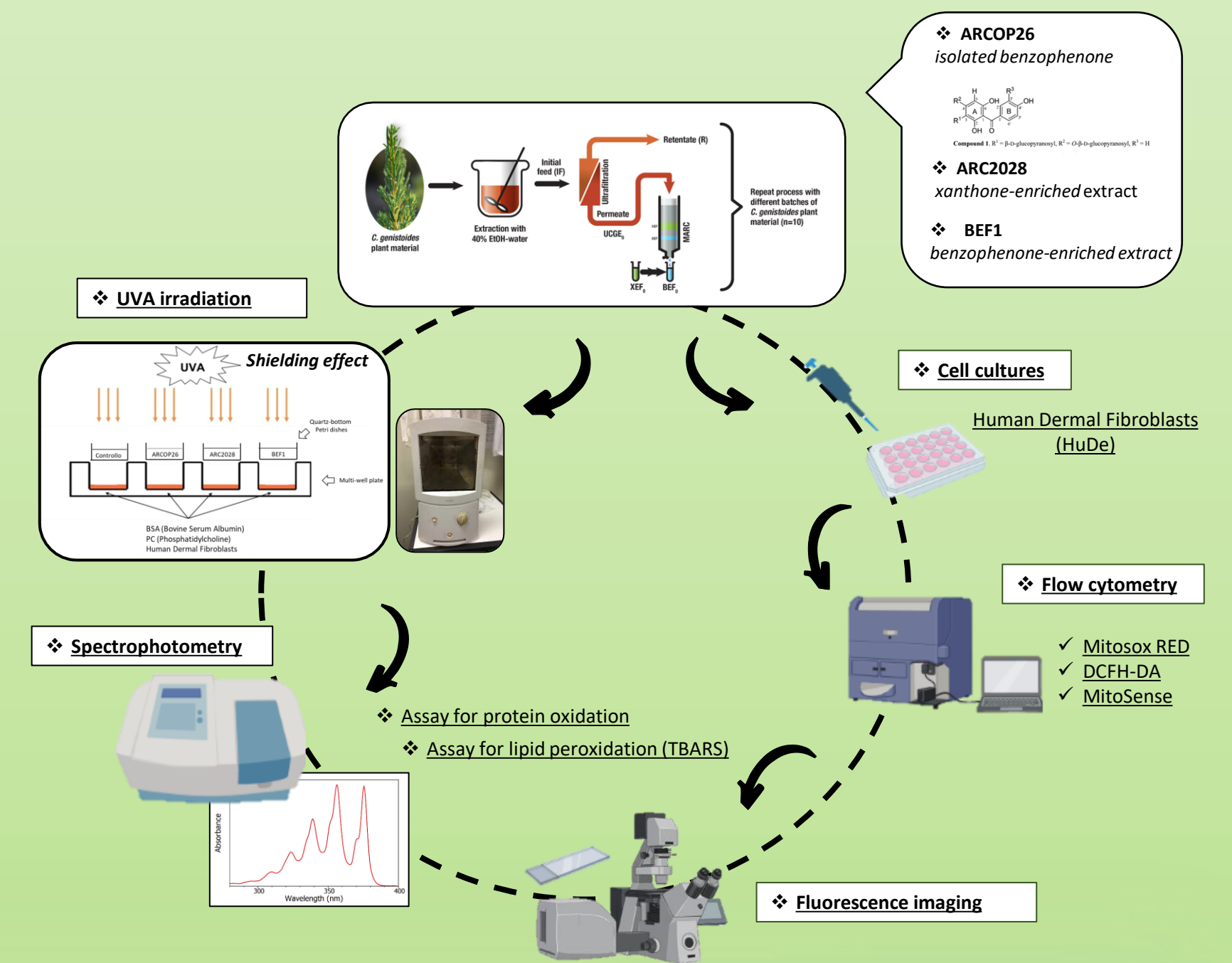


### Objective

The aim of this work was to investigate the potential of Honeybush (*Cyclopia spp.*) extracts, enriched in benzophenones, as photoprotective agents, which could partially substitute synthetic UV filters, such as benzophenone-3 (BP-3), that has come under scrutiny for its potential negative health and environmental effects (2).

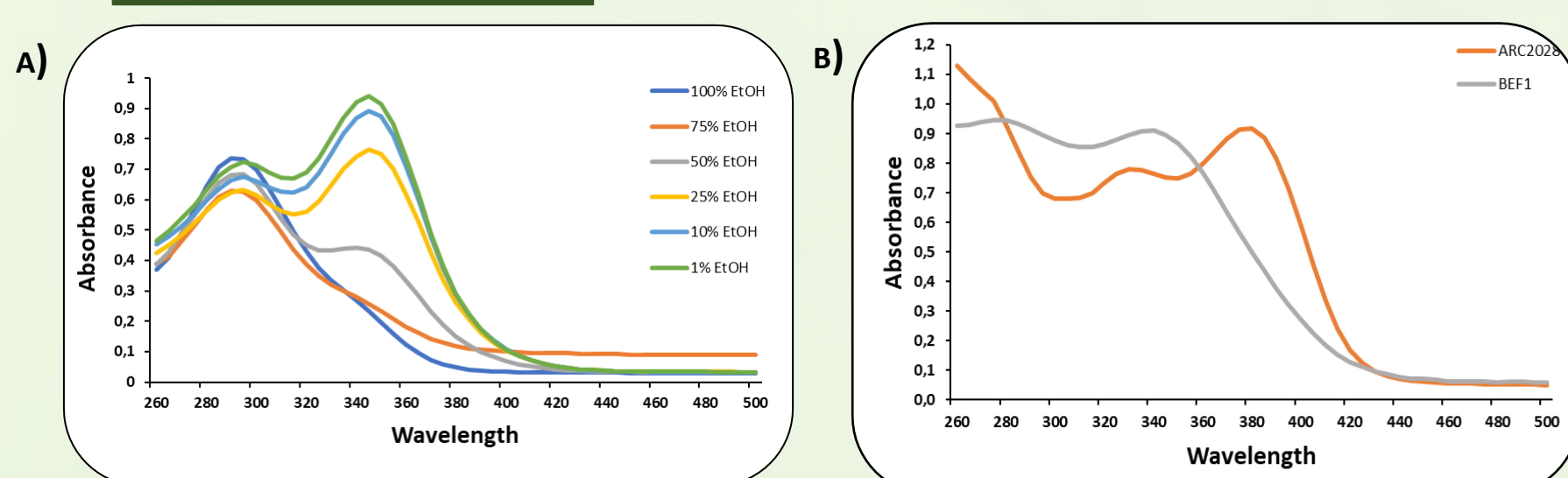


### Experimental design



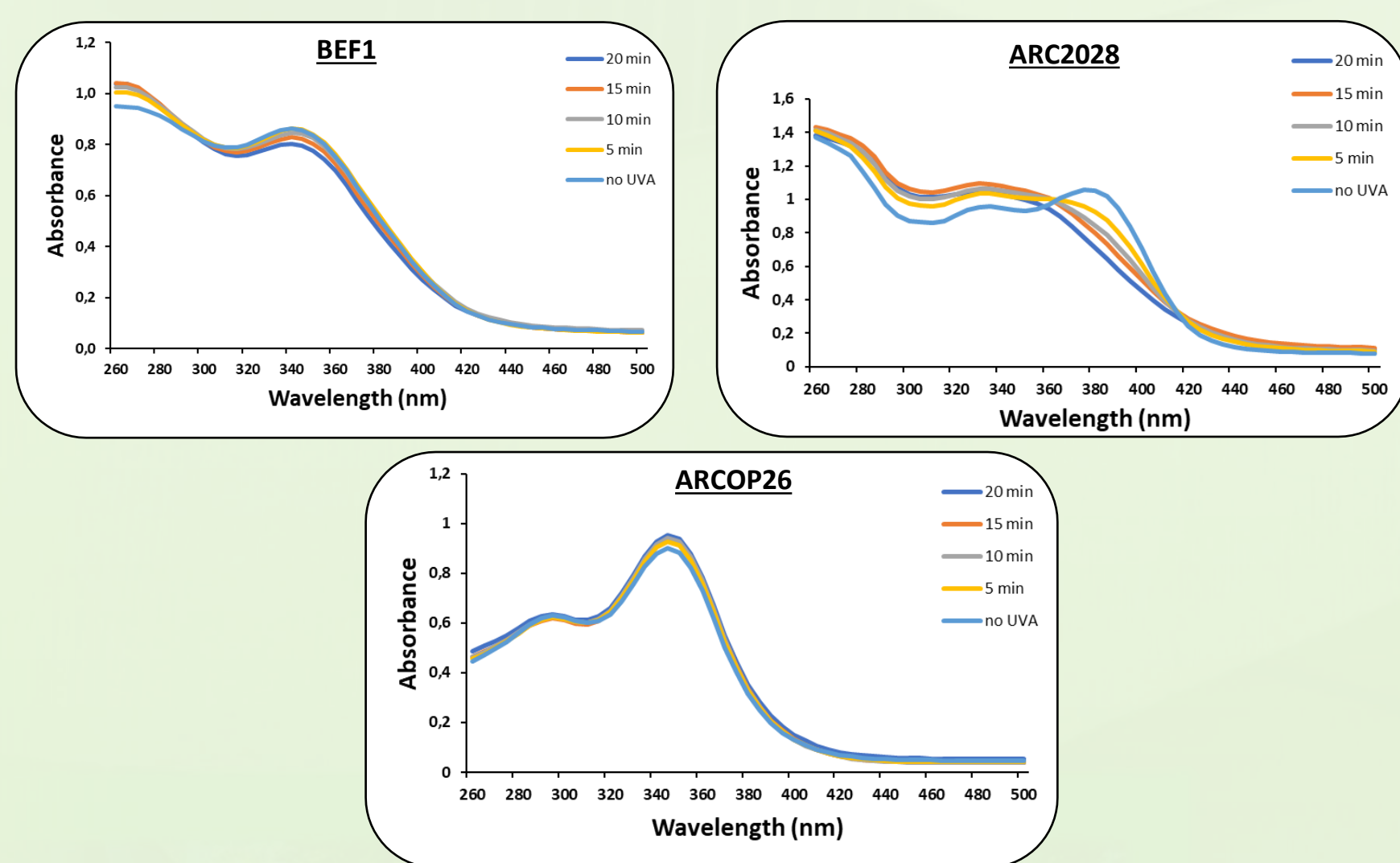
### Results and Discussion

#### Absorption spectra



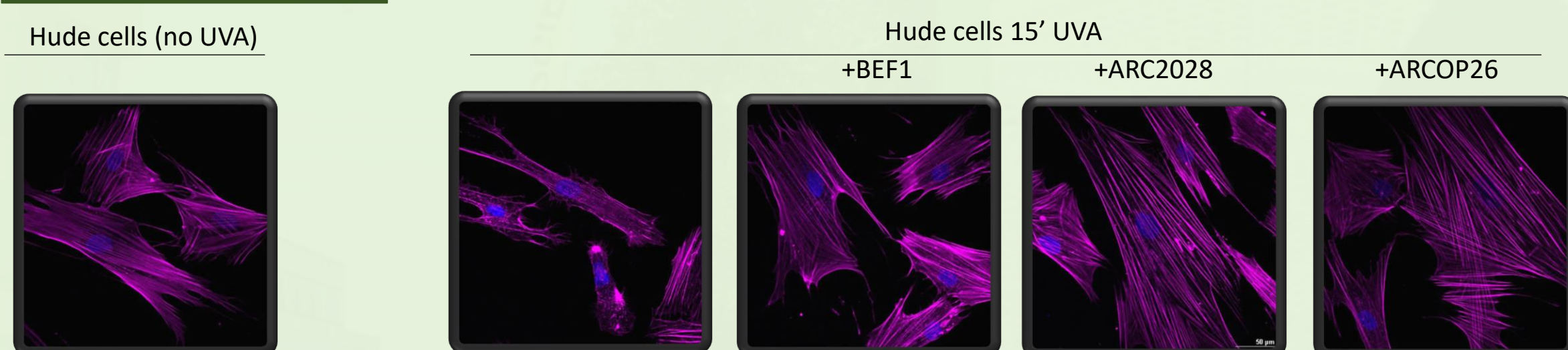
Absorption spectra of extracts from the Honeybush plant. (A) ARCOP26 200 µM dissolved in different percentages of ethanol; (B) ARC2028 and BEF1 10 mg/mL in 1% ethanol.

#### Photostability investigation



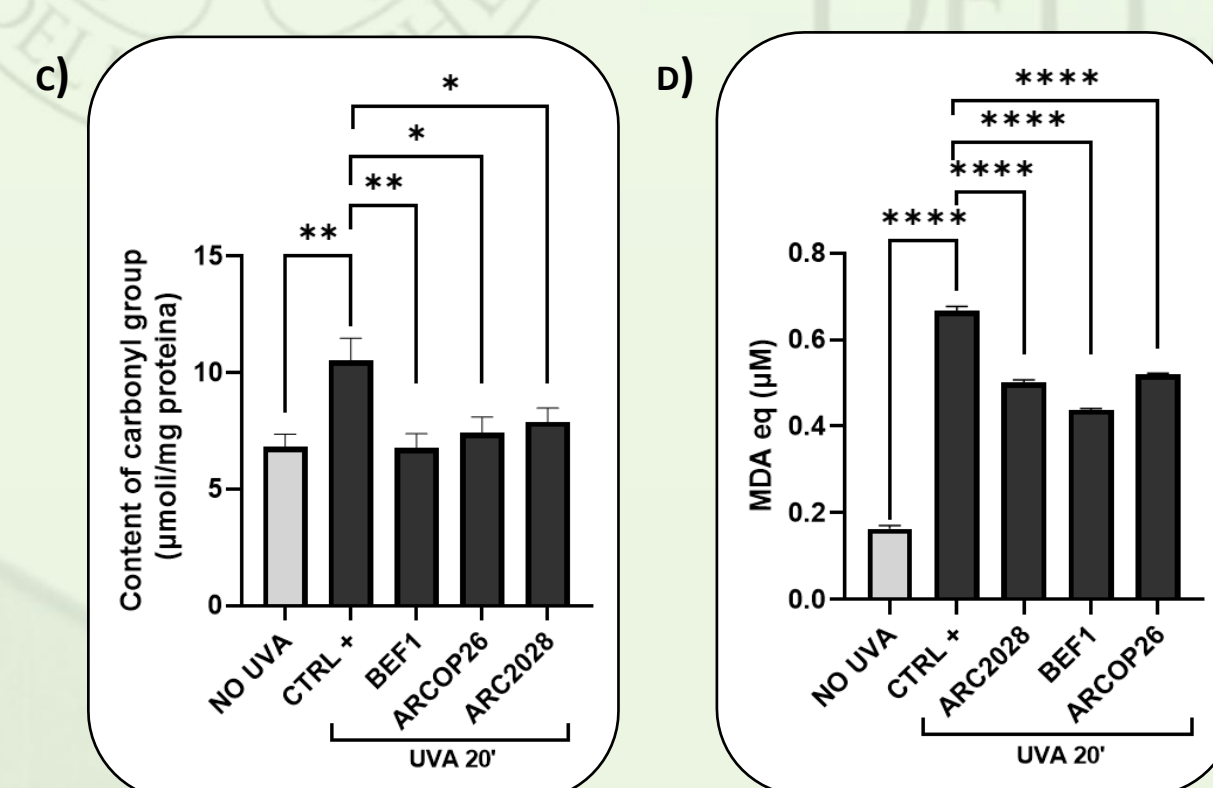
Absorption spectra of extracts from the Honeybush plant after different exposure times to UVA.

#### Fluorescent imaging



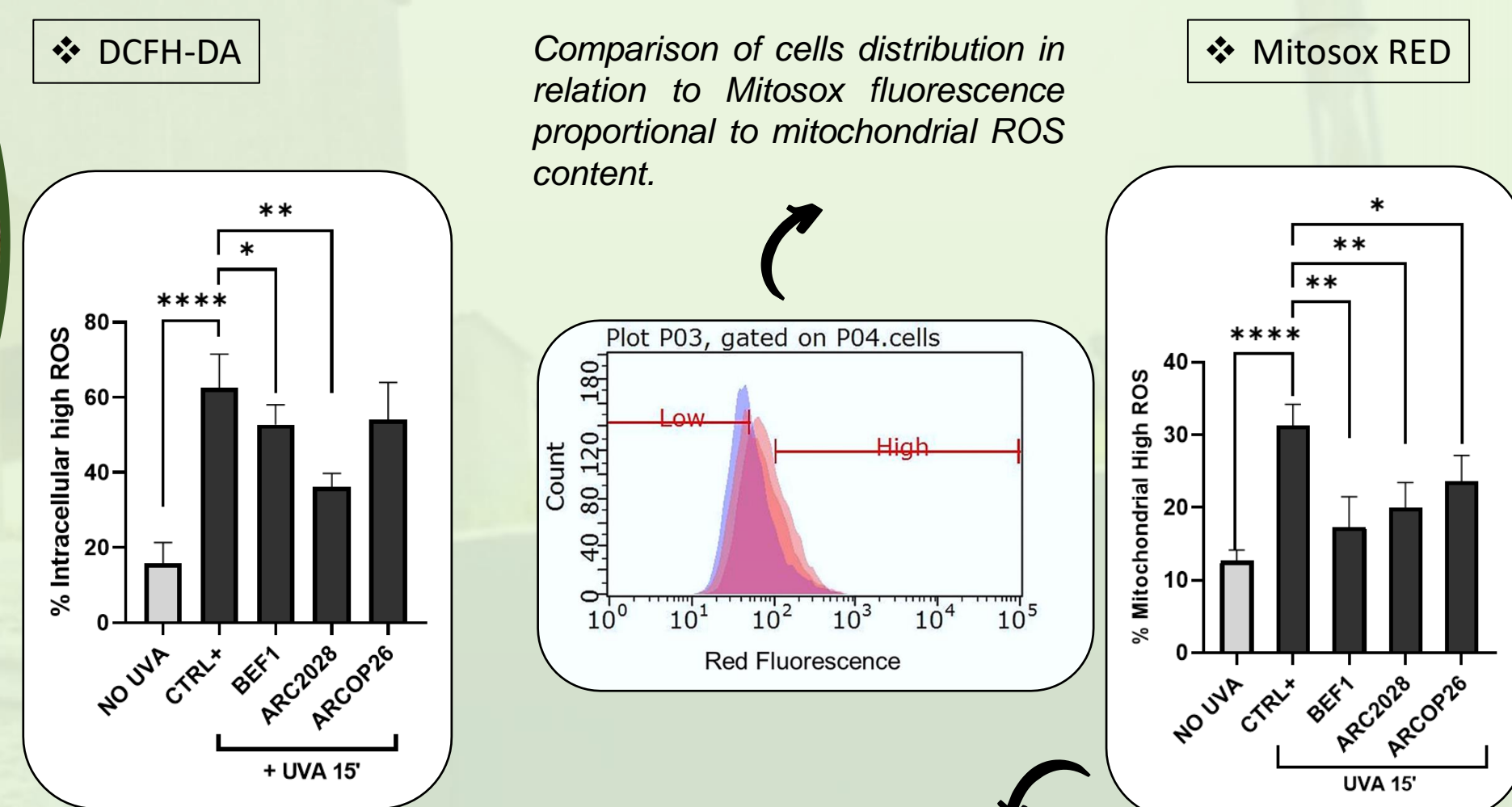
Fluorescence image of F-actin filaments stained with Phalloidin in Human Dermal Fibroblasts (HuDe) non-irradiated (left) and irradiated (right) in the presence or absence of Honeybush extract (ARC2028), benzophenone-enriched fraction (BEF1) and of iriflophenone diglucoside (ARCOP26) used as shielding agents. Nuclei are stained with DAPI.

#### Shielding effect on BSA and Liposomes



Oxidation damage in the presence or absence of honeybush extract (ARC2028), benzophenone-enriched fraction (BEF1) and of iriflophenone diglucoside (ARCOP26) used as shielding agents, in BSA (C) and PC liposomes (D) after 20 min UVA irradiation. (One-way ANOVA: \*\*\*\*p<0.0001; \*\*p<0.001; \*p<0.05 vs CTRL+).

#### Evaluation of the Photoprotective effects on cell cultures



Production of intracellular high ROS (expressed as a percentage) in Human Dermal Fibroblasts in the presence or absence of Honeybush extract (ARC2028) and of iriflophenone diglucoside (ARCOP26) used as shielding agents after 15 min UVA irradiation (One-way ANOVA: \*\*\*\*p<0.0001; \*\*p<0.01; \*p<0.05 vs CTRL+).

Production of mitochondrial high ROS (expressed as a percentage) in Human Dermal Fibroblasts in the presence or absence of Honeybush extract (ARC2028), benzophenone-enriched fraction (BEF1) and of iriflophenone diglucoside (ARCOP26) used as shielding agents after 15 min UVA irradiation (One-way ANOVA: \*\*\*\*p<0.0001; \*\*p<0.01; \*p<0.05 vs CTRL+).

### Conclusion

This study investigated the unexplored photoprotective potential of extracts from the Honeybush plant (*Cyclopia spp.*). The preliminary results reported above provide a promising starting point which need to be supported by further investigations in order to gain more insights on the photoprotective ability of this plant's extracts. The final aim is to be able to use these natural compounds in the future to replace, even partially, some synthetic filters, such as BP-3, commonly found in most sunscreens present on the market.

### References

- Gromkowska-Kępcza KJ, Puścion-Jakubik A, Markiewicz-Żukowska R, Socha K. The impact of ultraviolet radiation on skin photoaging - review of in vitro studies. *J Cosmet Dermatol.* 2021;20(11):3427-3431.
- Di Nardo JC, Down CA. Dermatological and environmental toxicological impact of the sunscreen ingredient oxybenzone/benzophenone-3. *J Cosmet Dermatol.* 2018;17(1):15-19
- Jesus A, Sousa E, Cruz MT, Cidade H, Lobo JMS, Almeida IF. UV Filters: Challenges and Prospects. *Pharmaceuticals (Basel).* 2022, 22;15(3):263