

PHOTOPROTECTIVE AND ANTIOXIDANT ACTIVITY OF VEGETABLE OILS

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Introduction

The use of sunscreens reduces or prevents the harmful effects caused by acute and chronic exposure to ultraviolet (UV) radiation including skin cancer [1]. However, UV filters can be absorbed through the skin and distributed in the human body, causing several effects [2]. Additionally, UV radiation leads to the generation of reactive oxygen species (ROS) which contribute to cellular oxidative damage and skin aging. Vegetable oils have a variety of benefits for the skin by their presence of many natural antioxidants components and have potential activity against oxidative stress and the ROS, and they are able to contribute on the sun protector factor (SPF) [3]. Antioxidant activity assay (AA) measures the ability of a substance to eliminate reactive oxygen species, making it possible to relate the antioxidant properties of vegetable oils with the protective function of the skin against oxidative stress [3]. This study aims to explore the photoprotective capacity of vegetable oils through a literature search indexed by the Web of Science core collection.

Material and Methods

The survey was carried out on August 8th, 2021 on the core collection of the Web of Science platform. The string used in the advances search was: “TS=((photoprotec* AND oil) OR (photoprotec* AND vegetable AND oil) OR (Photoprotec* AND natural AND oil))”. Resulting articles were previously evaluated using the title and abstract. Articles related to just essential oils and plant extracts, as well as those not related to photoprotection or antioxidant activity of vegetable oils, were excluded. Studies that were not found complete and studies that used just some isolated constituent or derived from vegetable oils (e.g. flavonoids) were also excluded.

Results and Discussion

According to the "web of science core collection", 200 results were found for the survey carried out. After individual evaluation, 28 studies were selected according to pre-established criteria. The most frequent vegetable oils present in these studies were green coffee oil, kenaf seed oil, pomegranate seed oil, pumpkin seed oil, and raspberry seed oil.

Some values found for *in vitro* SPF (by Mansur's method) of free vegetable oils were approximately 0.081 (Avocado oil), 0.004 (Coconut oil), 0.384 (Raspberry seed oil), and even remarkably 11.70 (Tamanu seed). For *in vitro* AA (by DPPH method) the values found were, about EC₅₀=433.5 µg/mL (Green coffee oil), DPPH=15.52 mg TE/100 mL sample (Pumpkin seed oil) for example.

Most studies 57.14% used some nanostructure, being the most present the nanostructured lipid carriers (NLC), and about 39.28% used also another antioxidant component in the formulation as naringenin, α -tocopherol, quercetin and others.

It was possible to observe that isolated vegetable oils generally have low SPF (with some exceptions) and high antioxidant capacity (depending on the type of vegetable oil). However, when these are present in nanostructured formulations or associated with other antioxidant substances or even UV filters, the photoprotective capacity of the final formulation is usually increased, either by increasing the SPF, the AA or reducing the damage caused by UV radiation.

Conclusion

Values of SPF and AA from free vegetable oils were analyzed, it appears that most oils have high antioxidant capacity, however, they show low values for SPF (with some exceptions). Nevertheless, most studies showed that, in general, the oils studied were able to increase the photoprotective capacity of the formulation. It is noteworthy that most studies were carried out with vegetable oils in association with other antioxidant components, synthetic filters, and various dosage forms. Thus, it is difficult to separate the photoprotective effect of the oil from the photoprotective effect of the formulation. However, vegetable oils do not fail to show promising photoprotective activity as adjuvants in formulations, perhaps, these results can be attributed to a probable synergism between the oil composition and the formulation. Furthermore, there are reports in the literature that vegetable oils are able to increase the SPF value *in vivo* and also improve the stability of photoprotective formulations.

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Bibliographic References

- [1] Yu, S.L.; Lee, S.K.: 'Ultraviolet radiation: DNA damage, repair, and human disorders'. Mol. Cell. Toxicol, 2017, 1, (13), pp 21-28.
- [2] Ruszkiewicz, J.A, Pinkas, A., Ferrer, B., *et al.*: 'Neurotoxic effect of active ingredients in sunscreen products, a contemporary review'. Toxicol. Rep., 2017, (4), pp 245–259.
- [3] Badea, G., Lăcătușu, I., Badea, N., *et. al.*: 'Use of various vegetable oils in designing photoprotective nanostructured formulations for UV protection and antioxidant activity', Ind. Crops. Prod., 2015, (67), pp 18-24.