NEW APPROACH TO POLYPHENOL-BASED COSMETIC INGREDIENTS

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SUMMARY

This article presents studies of the activity and composition of polyphenolic extracts obtained by a new innovative technology. The technology allows to preserve polyphenolic extracts without preservatives.

Introduction

Research authors biogründl, S. L. in the Spanish city of Barcelona belong to the study of active and auxiliary substances used in the cosmetic industry.

Polyphenols as active components for cosmetology and dermatology were of interest. On ecologically clean plantations of Spain grow vegetable raw materials, vegetables. All of them can serve as sources of polyphenols.

This article presents studies on the analysis of the activity and chemical composition of polyphenol extracts. To extract the active components, a unique process was used, which combines aqueous extraction without organic solvents, sterilization by fractional pasteurization and evaporation technology, which allows to obtain extracts of high concentration, without preservatives and preservation of all active substances intact.

Results and methods

In this study, polyphenolic extracts of various origins were studied: extracts of witch hazel, matcha green tea, cabbage, boldo, tea tree, cranberry, Arnica, Basil, nettle, elder, oat extract, Centella asiatica, cactus, wakame seaweed and many others.

To obtain 1 kg of polyphenol extract, an average of 4 kg of plant raw materials were used.

The innovative technology of Biogründl, S. L. consisted of three stages: extraction, pasteurization and evaporation. Extraction was carried out in water, controlling the time and temperature to maximize the release of active substances.

The process of low-temperature fractionated pasteurization ensures the removal of all microbial load (including spores) without exposing the extract to thermal effects. The technology of a thin layer of concentrated extract safely and quickly, keeping intact all the active ingredients.

DETERMINATION OF TOTAL POLYPHENOLS

To quantify the polyphenols contained in the obtained plant extracts, a spectrophotometric method was used. As a reagent, a mixture of phosphoric-tungsten and phosphoric-molybdenum acids in the basic medium (Folin-Chokalteu reagent) was used, which restore phenolic compounds, forming oxides of tungsten (W8O23) and molybdenum (Mo8O23) of blue color. These compounds absorb at a wavelength of 755 nm.

Gallic acid was used as a standard because it is the reference polyphenol described in the literature. The concentration of Gallic acid in the reaction medium is calculated from the calibration curve obtained by linear regression, with the total polyphenol content expressed in the equivalent of mg of Gallic acid per g of extract (mg of Gallic acid / g of extract).

Tested vegetable extracts:

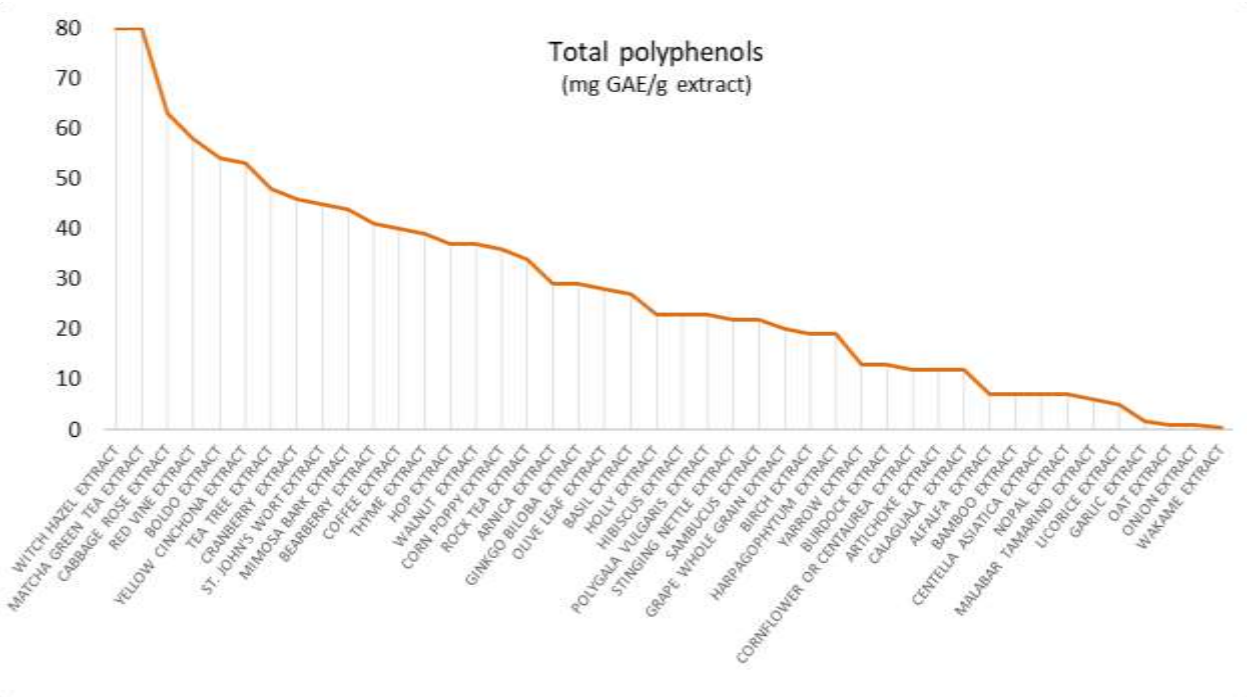

Fig.1 Content of polyphenolic compounds in plant extracts.

For fig. 1 presents proven extracts from 50 plant sources. The highest content of polyphenols (80 mg of Gallic acid/g of extract) is contained in glycerin witch hazel extract (WITCH HAZEL EXTRACT).

The antioxidant activity of polyphenol extract was compared with other known antioxidants (Fig.2)

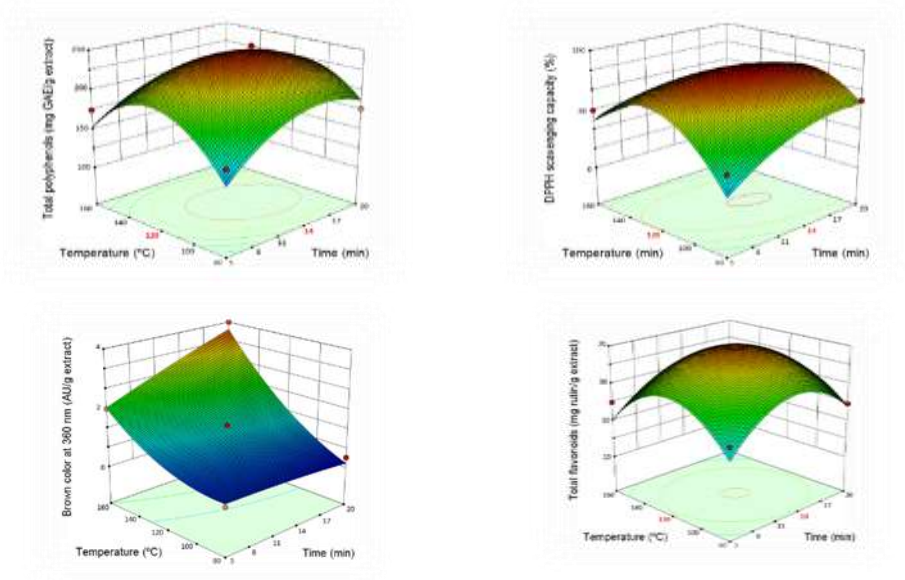

Fig. 2 Antioxidant activity.

It can be seen that the polyphenolic extract was not inferior to the activity of rutin, quercetin, but on the contrary, superior to them.

It was found that the polyphenolic extract was not inferior to the activity of rutin, quercetin, but on the contrary, superior to them.

The advantage of the new technology was the absence of preservatives. Fractional pasteurization, which eliminates vegetative forms and spores together with very low water activity, allows to preserve the resulting polyphenol extracts without preservatives.

With TLC, the complexity of the chemical composition of extracts can be visualized. (fig. 3).

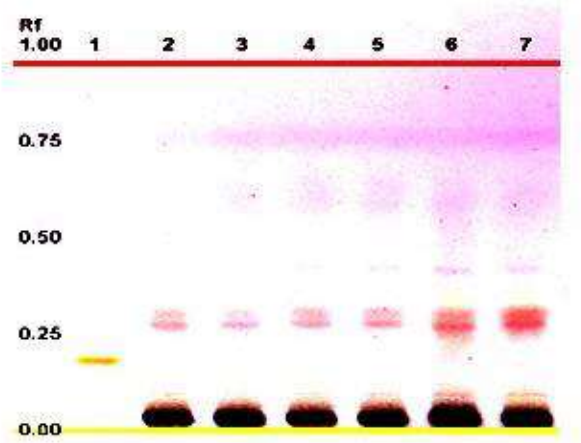

Fig. 3 TLC polyphenol extracts

Due to the high content of polyphenols obtained extracts have high antioxidant activity, and are most effective in the fight against oxidative stress.

The most significant biologically active compounds were standardized by HPLC, individually for each product. Thus, the quality of the entire process is guaranteed (Fig. 4).

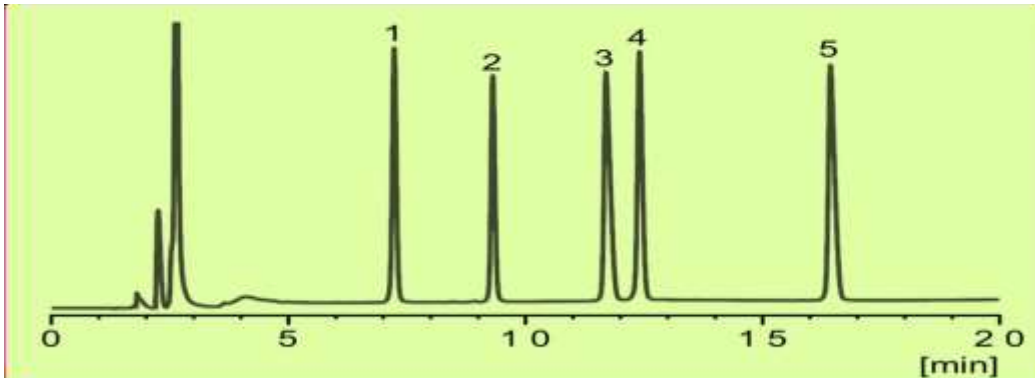

Figure 4. HPLC to standardize polyphenol extract

All other studies presented below were conducted with witch hazel extract. This extract contains the largest amount of polyphenols.

WITCH HAZEL EXTRACT RESEARCH

An increase in polyphenolic compounds in plant sources is usually associated with an increase in their antioxidant activity. Experiments using DPPH were conducted to study antioxidant activity. The technique is based on the ability of raw material antioxidants to bind a stable Chromogen radical 2,2-diphenyl-1-picrylhydrozyl (DPPH).

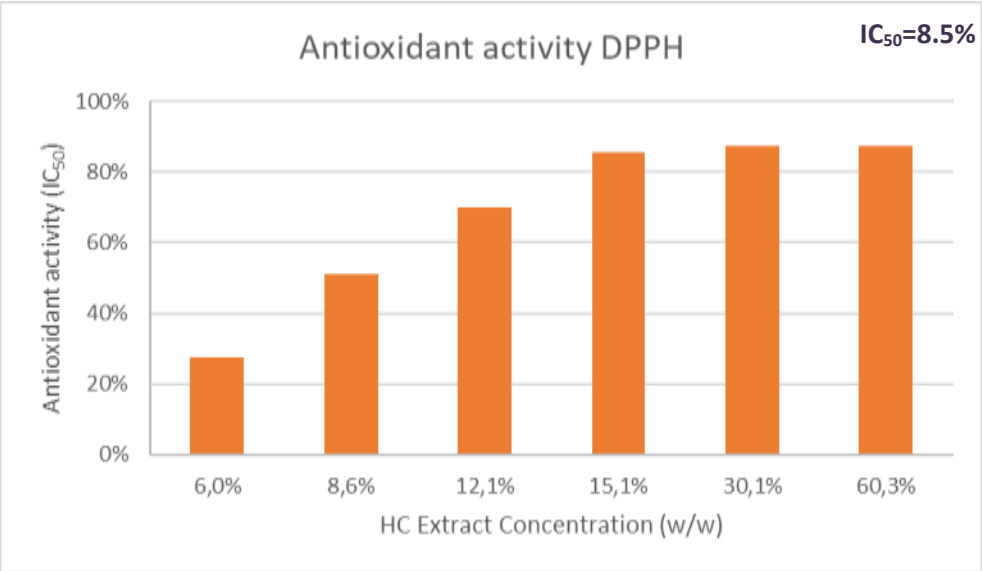

Figure 5. Antioxidant activity against DPPH free radical.

- The graph shows how an increase in the concentration of the HC extract is directly proportional to the antioxidant activity against DPPH.
- The antioxidant activity expressed as IC_{50} represents the concentration of extract (w/w) required to reduce the DPPH free radical by 50%.
- A low IC_{50} (8.5%) indicates a high antioxidant capacity.
- Significant antioxidant activity even at low extract concentrations.
- Confirmed antioxidant properties.

UV light absorption:

Next, the absorption of ultraviolet light by witch hazel extract was studied to assess its photoprotective properties. The absorption spectrum of the extract is shown in Fig. 6.

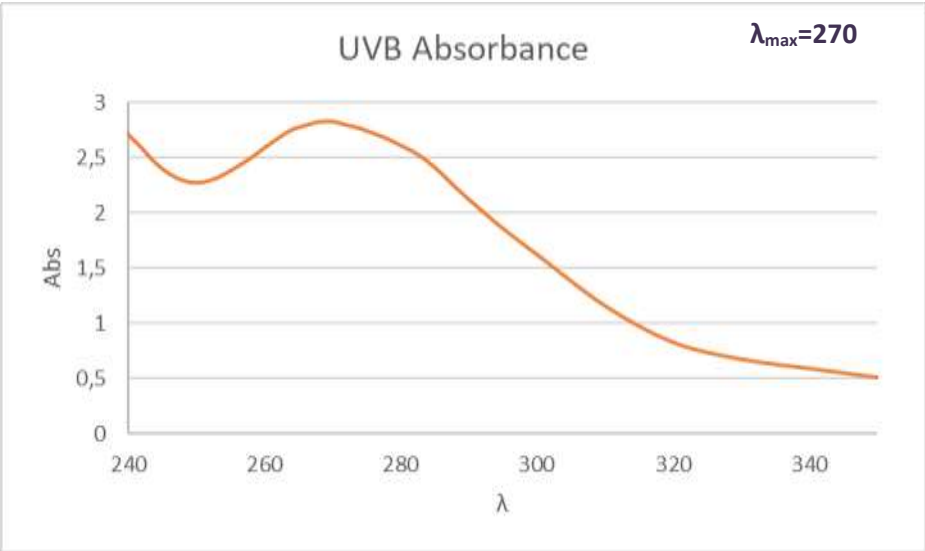

Figure 6. HC extract absorption spectrum (1: 1000 dilution)

- The exposure of the skin to UV radiation, in particular UVB component (280-320nm), produces adverse effects (among others: hyperpigmentation, sunburn, photoaging and skin cancer). Photochemoprevention, the use of agents capable of alleviating the adverse effects of UVB on the skin, can be applied through the use botanical antioxidants in skin care products.
- A promising new strategy is the use of polyphenolic plant extracts that favorably complement the protection of sunscreens and can provide additional protection against cell DNA damage and other skin disorders caused by UV radiation.
- In this sense, the UV light absorption activity of the WITCH HAZEL EXTRACT HC extract is perfectly adapted to these expectations, with very good absorbance values in the spectral range considered (1: 1000 dilution):
    - UVB: 280nm Abs = 2.610; 320nm Abs = 0.826
    - UVA: 350nm Abs = 0.509; 400nm Abs = 0.112
    - $\lambda_{max:}$ 270nm

Polyphenol extracts, including witch hazel extract, obtained by innovative technology showed high stability during storage. This was confirmed by the accelerated stability test at 40ºC shown in Fig. 7.

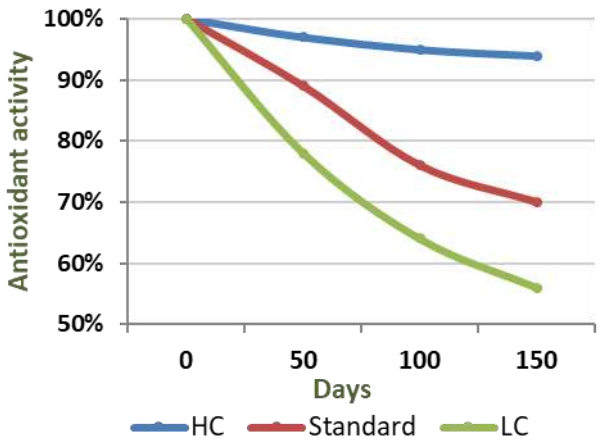

Figure 7. Stability test.

CONCLUSION

Research has contributed greatly to the study of plant ingredients. As we know, one of the most common problems in cosmetics is the inconvenience of including preservatives in the active raw materials, so the staff of Biogründl, S. L. has developed a unique extraction system that avoids the use of additional preservatives. Thanks to innovative technology, it has become possible to obtain very highly concentrated plant extracts with a significant amount of polyphenols.

Another point that is considered key is the opportunity to get a 100% natural active product for cosmetic purposes. As a summary, the figure clearly shows the benefits of using Biogründl HC extracts.

SOURCES

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