Exploring the Antimicrobial and Antioxidant Potential of Blueberry Leaves in Dermatology

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INTRODUCTION

- Blueberries are popular all over the world due to their flavoursome fruit, abundance of bioactive compounds and antioxidant activity. However, large quantities of leaves are discarded after pruning in many countries, so exploiting the bioactive compounds in the leaves would be very beneficial for the agricultural industry.
- This study highlights the applications of blueberry leaves, focusing on their dermatological, antioxidant, antimicrobial and antibiofilm activities.

THE AIM OF THE STUDY

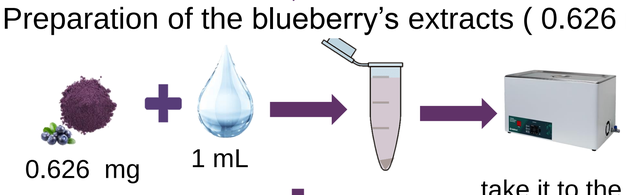
- Evaluate the feasibility of using blueberry leaves in the prevention and treatment of skin problems.
- To evaluate the antimicrobial efficacy against relevant skin pathogens and the ability to prevent biofilm formation

METHODOLOGY

Qualitative and quantitative evaluation of the chemical composition of blueberry extract and assessment of the total polyphenol content (TPC) of biologically active compounds, total polyphenol content (TPC), flavonoids (TFC) and selected phenolic acids using LC-MS

Evaluation of the antioxidant, anti-ageing and lightening properties of extracts

Preparation of the blueberry's extracts (0.626 mg/mL)



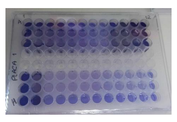
take it to the ultrasound bath to dissolve the extract

Tyrosinase, elastase and hyaluronidase inhibition assay by colorimetric method

Antibiofilm activity

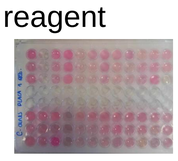
Mass quantification

Using the crystal violet method



Inhibition metabolic activity

Using resazurin reagent



Use of *Cutibacterium acnes* and *Staphylococcus aureus*

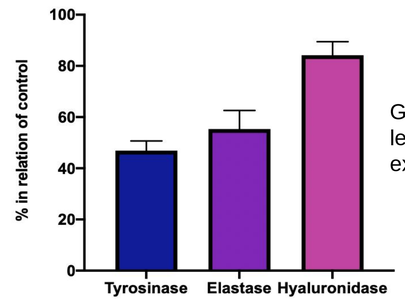
RESULTS

Table 1. *Retention time (Rt), wavelengths of maximum absorption in the visible region (λ_{max}), mass spectral data, identification and quantification (mg/g of extract) of phenolic compounds in blueberry aerial parts.*

Peak	Rt (min)	λ_{max} (nm)	[M-H] m/z	MS^2 (m/z)	Identification	Decoction	Infusion	Maceration	UAE
1	4.60	324	353	191(100),179(55),135(10)	3-*O*-Caffeoylquinic acid[1]	5.38±0.05^{b}	7±1^{c}	8.0±0.3^{d}	3.9±0.2^{a}
4	6.67	322	707	467(23),353(100),191(15)	**Caffeoylquinic acid dimer[1]**	40.7±0.4^{a}	43.3±0.3^{b}	46.0±0.4^{c}	46.0±0.4^{c}
6	8.95	283	863	711(28), 573(13), 451(15), 411(18), 289(6)	Procyanidin trimer[3]	5.8±0.1^{b}	6.2±0.1^{c}	4.1±0.1^{a}	8.8±0.1^{d}
7	9.91	282	863	711(25), 573(18), 451(13), 411(31), 289(10), 285(8)	Procyanidin trimer[3]	7.7±0.1^{d}	6.2±0.1^{b}	4.5±0.1^{a}	7.3±0.1^{c}
9	15.51	281	1153	865(37), 577(15),575(11),561(5), 289(10)	Procyanidin tetramer[3]	5.93±0.03^{b}	7.57±0.02^{c}	5.2±0.1^{a}	nd
/					**TPA**	56.3±0.1^{b}	60±1^{c}	56.0±0.1^{b}	54±1^{a}
					TP	20.1±0.1^{c}	20.9±0.2^{d}	14.4±0.1^{a}	16.1±0.2^{b}
					TOF	13.7±0.2^{b}	12.0±0.2^{a}	15.1±0.2^{d}	14.4±0.4^{c}
					TPC	90.1±0.2^{c}	93±1^{c}	85.5±0.4^{a}	85±1^{a}

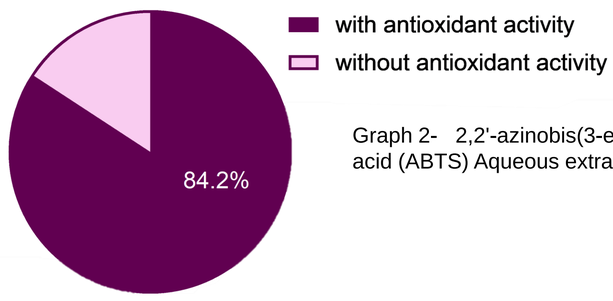
TPA-Total phenolic acids, TP -Total procyanidin, TOF-Total other flavonoids, TPC-Total phenolic compounds; calibration curves used: 1- chlorogenic acid (y = 168823x - 161172; R2 = 0.9999; LOD = 0.20 µg/mL; LOQ = 0.68 µg/mL), 2- caffeic acid (y = 388345x + 406369; R2 = 0.994; LOD=0.78 µg/mL; LOQ=1.97 µg/mL), 3- catechin (y = 84950x − 23200, R2 = 0.9999; LOD=0.17 µg/mL; LOQ=0.68 µg/mL), 4- quercetin-3-O-glucoside (y = 34843x − 160173, R2 = 0.9998; LOD=0.21 µg/mL; LOQ=0.71 µg/mL), 5- Apigenin-7-O-glucoside (y = 10683x - 45794; R2 = 0.999; LOD = 0.10 µg/mL; LOQ = 0.53 µg/mL). nd- not detected. Different letters in the same row show significant difference between means of the same compounds in different extraction methods. Different letters in each row mean statistically significant differences with a significance of 0.05.

Graph 1- Enzimatic inhibition activity



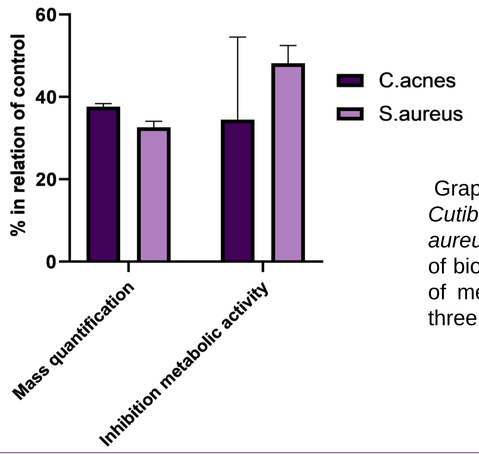
Graphy 1- Enzyme inhibition activity for aqueous blueberry leaf extracts. Mean values ± SD for three independent experiments are illustrated.

Graph 2- Antioxidant activity



Graph 2- 2,2'-azinobis(3-ethylbenzothiazoline-6-sulfonic acid (ABTS) Aqueous extracts of blueberry extracts.

Graph 3- Antibiofilm activity



Graph 3- Effect of extracts at biofilms of *Cutibacterium acnes* and *Staphylococcus aureus* with the percentage of quantification of biofilm mass and quantification of inhibition of metabolic activity. Mean values ± SD for three independent experiments are illustrated.

CONCLUSIONS

The results obtained indicate that blueberry leaves could be an interesting by-product to be applied as a component of cosmetic and dermatological preparations with antioxidant, antimicrobial and antibiofilm properties.

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