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PHYTOCHEMICAL CHARACTERISATION AND ANTIOXIDANT ACTIVITY OF ANTHOCYANINS FROM EDIBLE FLOWERS

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Introduction

Anthocyanins are water-soluble flavonoid pigments that give plants their red, purple, and blue colors. Beyond pigmentation and plant defense, these compounds show significant biological activity in humans, including strong antioxidant properties and therapeutic potential. Their structural variations affect both color stability and bioavailability. Comprehensive characterization of anthocyanins in edible flowers is essential for identifying new sources of bioactive pigments for functional foods, pharmaceuticals, and cosmetics

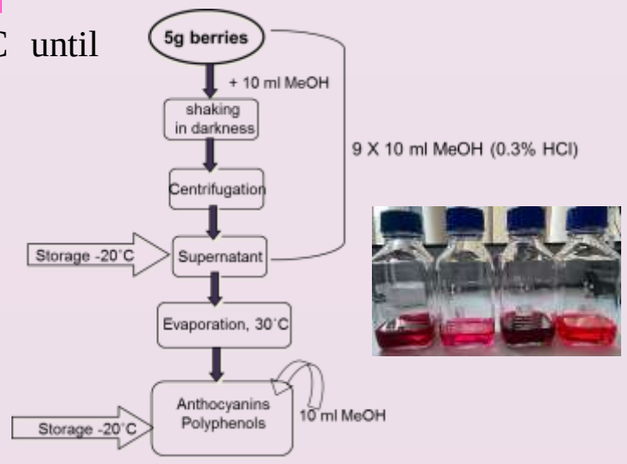
Objectives

This study aimed to comprehensively characterize the anthocyanin profiles and evaluate the antioxidant activity of petal extracts from diverse edible flower species, establish correlations between anthocyanin composition and antioxidant capacity to provide insights for selecting botanical sources with enhanced bioactive properties.

Material and Methods

Samples: Flower samples were stored at 18 ℃ until analysis.

Anthocyanins extraction



Identification & Quantification of anthocyanins

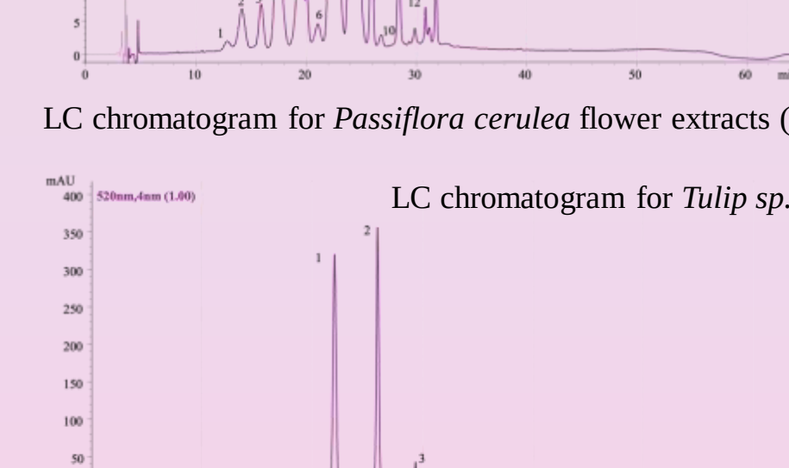
Column : Luna Phenomenex C-18, **T**= 35 ºC
Absorbance : 520 nm

HPLC –PDA Shimadzu System
Gradient:
(A) 4.5% formic acid
(B) acetonitrile
Flow : 0.8 ml/min

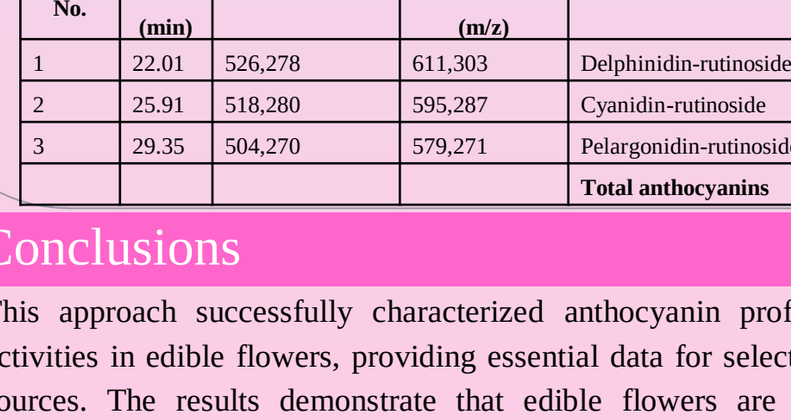
HPLC-PDA/MS-ESI Agilent 1200
Gradient:
(A) 1% acid formic
(B) acetonitrile
Spray voltage -3000 V
MS/ MS2- 70 and 130 eV
Ions scan: 260 to 1000 *m/z*

Results and Discussion

This study clearly demonstrates that flowers are a rich source of anthocyanins



LC chromatogram for *Viola odorata* extracts (520nm)



LC chromatogram for *Passiflora cerulea* flower extracts (520 nm)

Table 1 Anthocyanins identification and quantification in *Violet sp*. extracts

Peak No.	Rt (min)	UV max	[M+H] (m/z)	Anthocyanin	Concentration (ug/mL extract)
1	12.73	523,278	773	Delphinidin-glucosyl-rutinoside	8.776
2	15.71	522,277	741	Pelargonodin-glucosyl-rutinoside	8.508
3	32.25	531,330sh,280	919	Pelargonodin-(caffeoyl-sophorosyl)-glucoside	9.852
4	32.86	531,330sh,280	757	Pelargonodin-sophorosyl-glucoside	17.380
5	35.28	531,330sh,280	1243	Pelargonodin-(dicaffeoyl-sophorosyl-glucosyl)-glucoside	13.616
6	37.25	520,330sh,280	1405	Pelargonodin-di(caffeoyl-sophorosyl)-glucosyl-glucoside	8.239
				Total anthocyanins	**66.371**

Table 2 Anthocyanins identification and quantification in *Tulip sp*. extracts

Peak No.	Rt (min)	UV max	[M+H] (m/z)	Anthocyanin	Concentratie (ug/mL extract)
1	11			Not identified	-
2	14.14	521,276	611	Delphinidin-rutinoside	2.800
3	15			Not identified	-
4	17.39	515,277	611	Cyanidin-diglucoside	2.925
5	19.42	524,278	465	Delphinidin-glucoside	3.374
6	21			Not identified	-
7	23.08	517,279	449	Cyanidin-glucoside	3.642
8	24.51	528,280	479	Petunidin-glucoside	4.061
9	26.79	530,280	655	Malvidin-diglucoside	6.026
10	27			Not identified	-
11	28	530,280	493	Malvidin-glucoside	4.180
12	31.77	526,310sh,278	611	Delphinidin-p-coumaroyl-glucoside	2.105
13	38.40	529,310sh,280	609	Peonidin-p-coumaroyl-glucoside	3.091
				Total anthocyanins	**32.205**

LC chromatogram for *Tulip sp*. extracts (520nm)

LC chromatogram for *Rosa sp*. extracts (520nm)

Table 3 Anthocyanins identification and quantification in *Tulip sp*. extracts

Peak No.	Rt (min)	UV max	[M+H] (m/z)	Anthocyanin	Concentratie (ug/mL extract)
1	22.01	526,278	611,303	Delphinidin-rutinoside	297.005
2	25.91	518,280	595,287	Cyanidin-rutinoside	378.204
3	29.35	504,270	579,271	Pelargonidin-rutinoside	66.852
				Total anthocyanins	**742.062**

Table 3 Anthocyanins identification and quantification in *Rosa damascena* extracts

Peak No.	Rt (min)	UV max	[M+H] (m/z)	Anthocyanin	Concentratie (ug/mL extract)
1	17.18	513,276	611,287	Cyanidin-diglucoside	23.941
2	23.61	516,276	449,287	Cyanidin-glucoside	7.970
3	35.30	526,280	479,317	Petunidin-glucoside	8.024
				Total anthocyanins	**39.934**

Conclusions

This approach successfully characterized anthocyanin profiles and antioxidant activities in edible flowers, providing essential data for selecting anthocyanin-rich sources. The results demonstrate that edible flowers are valuable sources of bioactive compounds with therapeutic and industrial potential.

References

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2. Mattioli, R., Francioso, A., Mosca, L., & Silva, P. (2020). Anthocyanins: A Comprehensive Review of Their Chemical Properties and Health Effects on Cardiovascular and Neurodegenerative Diseases. *Molecules*, 25(17), 3809.