

## Supplementary Information

# Comparison of Phenolic Compounds and Evaluation of Antioxidant Properties of *Porophyllum ruderale* (Jacq.) Cass (*Asteraceae*) from Different Geographical Areas of Queretaro (Mexico)

Ángel Félix Vargas-Madriz <sup>1</sup>, Ivan Luzardo-Ocampo <sup>2,3</sup>, Jorge Luis Chávez-Servín <sup>1</sup>, Ulisses Moreno-Celis <sup>1</sup>, Octavio Roldán-Padrón <sup>1</sup>, Haidel Vargas-Madriz <sup>4</sup>, Haydé Azeneth Vergara-Castañeda <sup>5</sup> and Aarón Kuri-García <sup>1,\*</sup>

<sup>1</sup> Department of Cell and Molecular Biology, School of Natural Sciences, Universidad Autonoma de Queretaro, Qro 76230, Mexico; angel.vargas@uaq.mx (Á.F.V.-M.); jorge.chavez@uaq.mx (J.L.C.-S.); ulisses.moreno@uaq.mx (U.M.-C.); octavio.roldan@uaq.mx (O.R.-P.)

<sup>2</sup> Tecnologico de Monterrey, The Institute for Obesity Research, Ave. Eugenio Garza Sada 2501 Sur, Monterrey 64841, Mexico; ivan.8907@gmail.com

<sup>3</sup> Tecnologico de Monterrey, School of Engineering and Sciences, Campus Guadalajara, Av. General Ramon Corona 2514, Zapopan 45201, Mexico

<sup>4</sup> Department of Agricultural Production, Centro Universitario de la Costa Sur, University of Guadalajara, Av. Independencia Nacional, No 151, Autlán 48900, Mexico; haidel\_vargas@hotmail.com

<sup>5</sup> Advanced Biomedical Research Center, School of Medicine, Universidad Autonoma de Queretaro, Qro 76140, Mexico; hayde.vergara@uaq.mx

\* Correspondence: aaron.kuri@uaq.mx

**Citation:** Vargas-Madriz, Á.F.; Luzardo-Ocampo, I.; Chávez-Servín, J.L.; Moreno-Celis, U.; Roldán-Padrón, O.; Vargas-Madriz, H.; Vergara-Castañeda, H.A.; Kuri-García, A. Comparison of Phenolic Compounds and Evaluation of Antioxidant Properties of *Porophyllum ruderale* (Jacq.) Cass (*Asteraceae*) from Different Geographical Areas of Queretaro (Mexico). *Plants* **2023**, *12*, 3569. <https://doi.org/10.3390/plants12203569>

Academic Editor: Ain Raal

Received: 18 September 2023

Revised: 10 October 2023

Accepted: 11 October 2023

Published: 14 October 2023



**Copyright:** © 2023 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

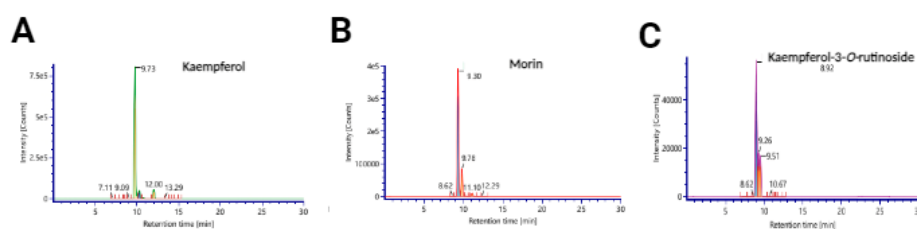
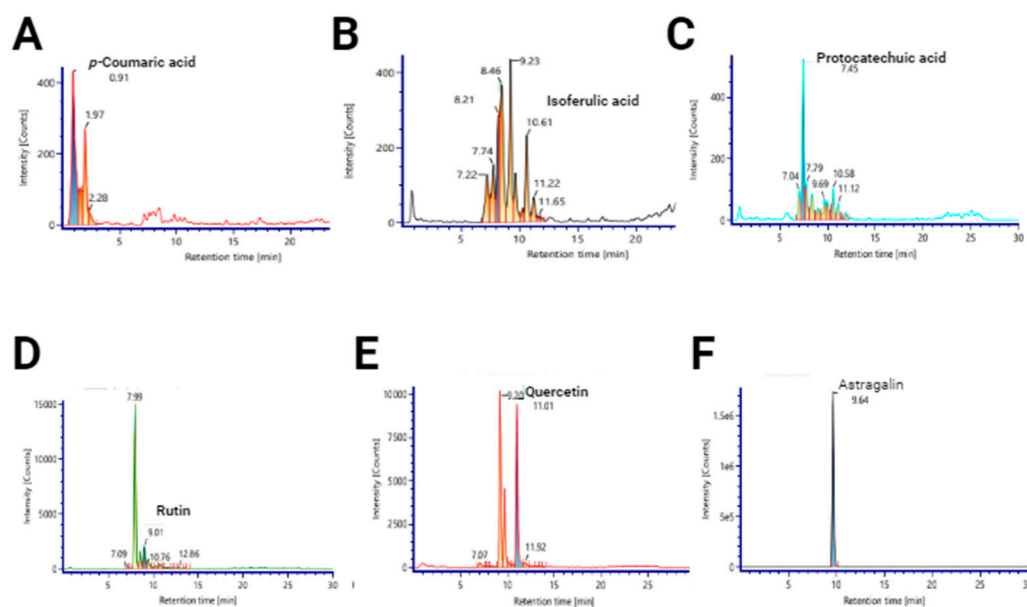
**Supplementary Table S1.** Content of phenolic compounds quantified by HPLC-DAD for *P. ruderale* from Landa de Matamoros and Jalpan de Serra.

Compound name	RT (min)	Landa de Matamoros (mg eq./g DW)	Arroyo Seco (mg eq./g DW)
<i>Hydroxycinnamic acids and derivatives</i>			
Chlorogenic acid	10.58	12.3 ± 0.2	8.5 ± 0.04*
Sinapic acid	11.67	5.3 ± 0.1	6.5 ± 0.07*
Caffeic acid	11.82	6.7 ± 0.1	0.6 ± 0.03*
<i>p</i> -Coumaric acid	14.42	18.8 ± 0.1	4.5 ± 0.01*
Ferulic acid	15.35	19.4 ± 0.3	2.1 ± 0.02*
<i>Hydroxybenzoic acids and derivatives and benzaldehydes</i>			
Gallic acid	7.49	1.2 ± 0.01	2.6 ± 0.01*
Hydroxybenzoic acid	12.35	11.3 ± 0.01	2.3 ± 0.02*
<i>Benzenoids</i>			
Hydroxyphenylacetic acid	9.89	20.3 ± 0.01	6.7 ± 0.03*
<i>Flavonols</i>			
Rutin	12.9	1.2 ± 0.01	2.0 ± 0.17*
Quercetin	18.44	0.5 ± 0.01	0.1 ± 0.01*
(+)-catechin	10.85	73.4 ± 0.4	106.4 ± 0.76*
Epicatechin	11.55	240.7 ± 2.0	195.2 ± 4.02*
Epigallocatechin gallate	11.8	36.1 ± 0.01	39.7 ± 0.14*

The results are expressed as the mean ± S.D. of three independent extractions, in triplicate. The asterisks indicate significant differences ( $p < 0.05$ ) by Student's test. DW: dry weight; RT: retention time.

**Supplementary Table S2.** Principal components, percentual participation, and cumulative percent.

Principal component (PC)	Percent	Cumulative percent
1	92.75	92.75
2	5.03	97.78
3	2.22	100.00

**Supplementary Figure S1.** Representative pictures from the Mass spectrometry analysis (ESI+) of some of the identified metabolites in *P. ruderalis* leaves. (A) Kaempferol, (B) Morin, (C) Kaempferol-3- O-rutinoside**Supplementary Figure S2.** Representative pictures from the Mass spectrometry analysis (ESI-) of some of the identified metabolites in *P. ruderalis* leaves. (A) *p*-Coumaric acid, (B) Isoferulic acid, (C) Protocatechuic acid, (D) Rutin, (E) Quercetin, (F) Astragalin.

**Supplementary Table S3.** Curves for each standard used in the HPLC-DAD analysis.

Compound	Standard Curve	R <sup>2</sup>
Chlorogenic acid	$y=18434x + 90.485$	0.991
Sinapic acid	$y=25013x - 3.5893$	0.999
Caffeic acid	$y=42480x - 19.435$	0.999
<i>p</i> -Coumaric acid	$y=803.24x + 71.788$	1.000
Ferulic acid	$y=38663x + 1851.8$	0.996
Gallic acid	$y=26099x + 275.90$	0.999
Hydroxybenzoic acid	$y=4.2007x - 78.089$	0.990
Hydroxyphenylacetic acid	$y=3.4788x - 187.63$	0.998
Rutin	$y=20150x + 222.76$	1.000
Quercetin	$y=50105x - 397.9$	0.995
(+)-catechin	$y=7835.1x+20.686$	0.997
Epicatechin	$y=10.072x - 143.04$	0.991
Epicatechin gallate	$y=3.7738x - 26.299$	0.990