Phenolic profile and antioxidant activity of ethanolic extract of *Larrea cuneifolia* Cav leaves

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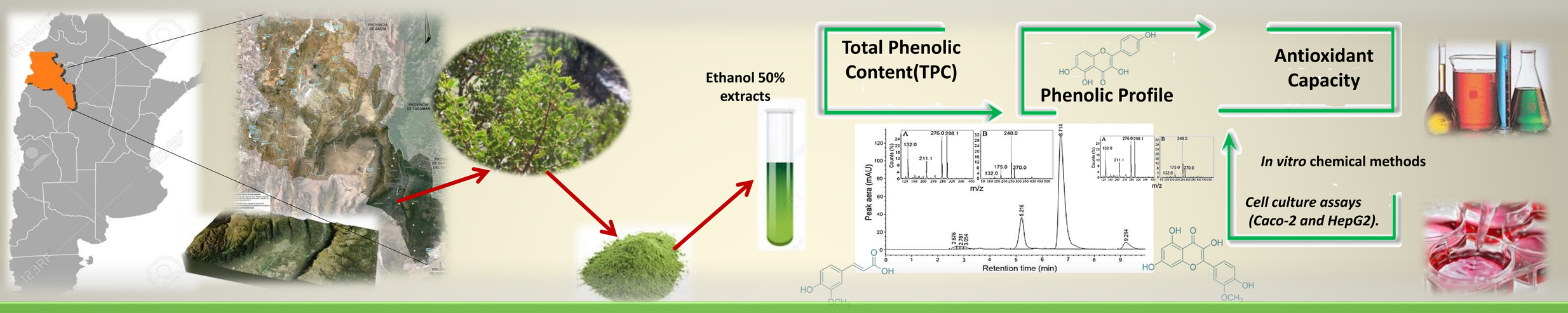
Introduction

Larrea cuneifolia Cav. it`s a specie that belongs to the Zygophyllaceae family, which includes species of evergreen shrubs distributed throughout the American continent. Most of the pharmacological studies focus on the antioxidant, antimicrobial, and antitumor activity of extracts of *L. divaricata* Cav. and one of the main chemical components, nordhydroguayaretic acid (ANHG). But few studies are devoted to the antioxidant properties of *L. cuneifolia.*

Polyphenols are a group of compounds that have important organoleptic and health properties, generated as a product of the secondary metabolism of plants and are attributed the ability to be antioxidants. Some also have other associated biological activities, such as anti-microbial, anti-inflammatory and antitumor activities. That´s why there is a growing interest in characterizing the phenolic compounds present in different plant tissues

The objective of this work was to determine the total polyphenols content (TPC) and the main phenolic composition of L. cuneifolia leaf extracts. Furthermore, the antioxidant activity was evaluated through in vitro chemical and cell culture tests (Caco-2 and HepG2).

Materials and Methods

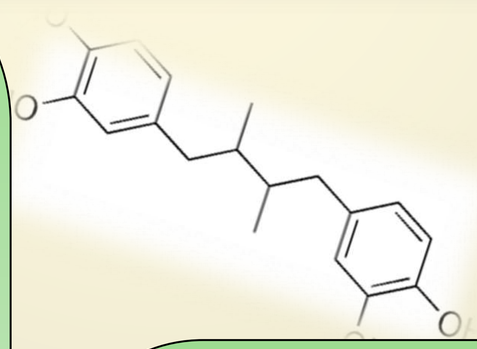


Results and Discussions

Identification of phenolic compounds by HPLC-ESI-MS / MS

Nº	RT (min)	Tentatively Identified Compound	Molecular formula	[M-H] (m/z) theoretical	[M-H] (m/z) experimental	Error ppm	MS/MS
1	11.4	4- caffeoylquinicacid	$C_{16}H_{17}O_9$	3.530.878	353.084	10.2	191
2	12.8	3- caffeoylquinicacid	$C_{16}H_{17}O_9$	3.530.878	353.084	9.6	191
3	18.9	Quercetin rutinoside	$C_{27}H_{29}O_{16}$	6.091.461	609.147	-0.9	301
4	19.2	Quercetin glucoside	$C_{21}H_{19}O_{12}$	4.630.882	463.089	-1.7	301
5	20.0	Kaempferolhexoside isomer II	$C_{21}H_{19}O_{11}$	4.470.933	447.094	2.5	285
6	20.2	Dihydroisorhamnetin	$C_{16}H_{13}O_7$	3.170.667	317.068	3.9	299, 289, 273, 258, 231, 207
7	21.2	Isorhamnetinrhamnosyl glucoside	$C_{28}H_{31}O_{16}$	6.231.618	623.163	-2.5	315
8	24.4	Dimethyl gossypetin	$C_{17}H_{13}O_8$	3.450.616	345.062	0.4	
9	24.7	Trimethylgossypetin	$C_{18}H_{15}O_8$	3.590.772	359.079	3.7	315, 273,
10	24.8	Naringenin	$C_{15}H_{11}O_5$	2.710.612	271.062	-1.6	177, 151, 227
11	25.5	Quercetin methylether isomer I	$C_{16}H_{11}O_7$	315.051	315.056	16.7	300
12	27.6	Kaempferol	$C_{15}H_9O_6$	2.850.405	285.041	1.7	
13	27.8	Quercetin methylether isomer II	$C_{16}H_{11}O_7$	315.051	315.053	5.8	300
14	28.1	meso-(rel7S,8S,7'R,8'R)-3,4,3',4'-tetrahydroxy7,7'-epoxylignan	$C_{19}H_{22}O_5$	3.291.394	329.141	-3.3	177
15	28.9	Trihydroxytrimethoxy flavone	$C_{18}H_{15}O_8$	3.590.772	359.078	1.7	344, 329, 316, 301, 273
16	31.0	NDGA nordihydroguayareticacid	$C_{18}H_{21}O_4$	3.011.445	301.146	6	273, 268, 299
17	32.0	Trimethyl quercetin	$C_{18}H_{15}O_7$	3.430.823	343.086	9.2	328, 313
18	34.2	MNDGA 3-methylnordihydroguayareti cacid	$C_{19}H_{24}O_4$	3.151.602	315.162	6.7	300

Hydroxicinnamic acids · Flavanone · Flavolignan · Flavonoids · Flavone · Lignans



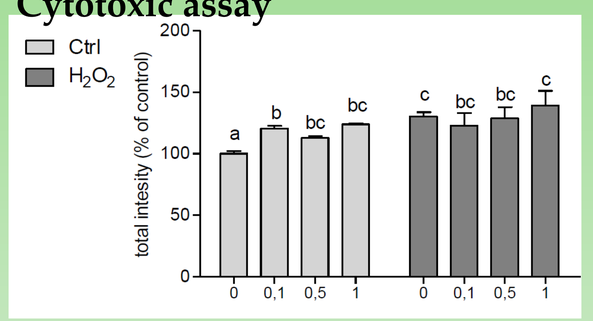
Total phenolic content and antioxidant activity

TPC	Antioxidant activity (in vitro chemical methods)		
Folin- Ciocalteu	DPPH	FRAP	TEAC
µg gallic acid mg-1 dry leaf sample	*mmol of Trolox 100 g-1 sample*		
228.1 ± 33.8	94.7± 11.6	77.3 ± 9.3	114.4 ± 23.7

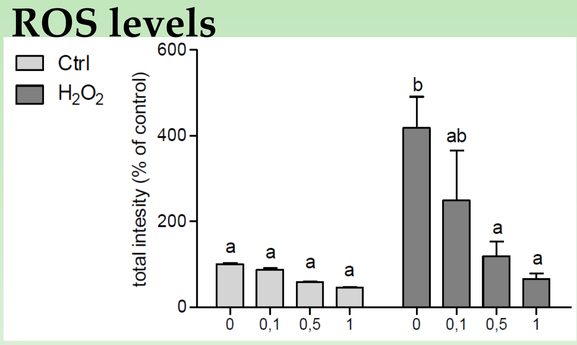
Antioxidant activity determined by cell culture assays

a) HepG2

Cytotoxic assay

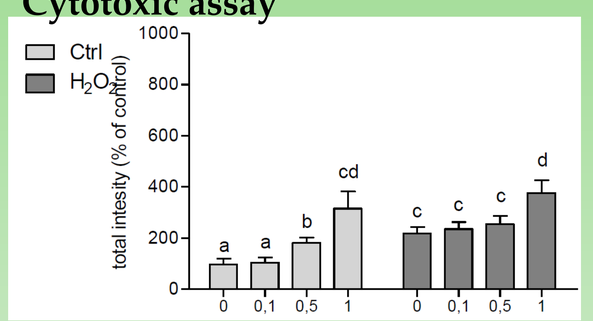


ROS levels



b) Caco2

Cytotoxic assay



ROS levels

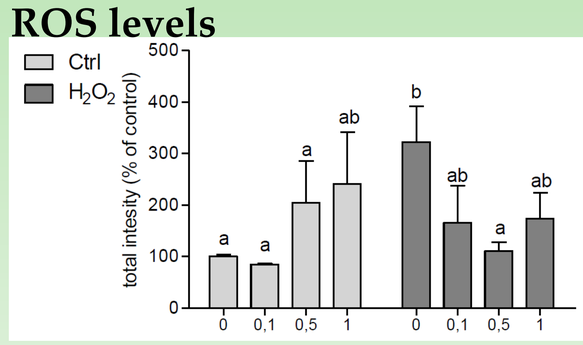


Figure 1. Cytotoxicity determined by Trypan Blue Test and ROS level ROS levels measured by DCFH at different concentrations of the extract of *L cuneifolia* leaf (0, 0.1, 0.5 and 1 mg / mL) in HepG2 cell lines (a) and Caco-2 (b) in medium with and without H_2O_2.

Conclusions

- *Larrea Cunelfolia* extracts showed high polyohenol content and in vitro antioxidant activity compared with previous reports (Rossi *et al*., 2008; Dadé *et al*., 2009; Borneo *et al.,* 2009 and Peralta 2019)
- The main polyphenolic components are the NDGA derivatives and flavonols in addition to lignans, flavolignans and cinnamic acids.
- In the activity on HepG2 cell culture lines, a significant decrease in ROS concentration was observed when cells are exposed to H_2O_2, showing a potential antioxidant activity.
- On the other hand on Caco2 cells a citotoxyc effect is primarily observed. This effect can be used to study compounds with bioactivity in the search for new oncological treatments.
- This species is considered a **potential source of bioactive compounds for the production of functional foods**.

Bibliography:

- Rossi, C. A.; Pereyra, A. M.; González, G. L.; De León, M.; Chagra Dib, P. Composición química, contenido de polifenolest otales y valor nutritivo en especies de ramoneo del sistema silvopastoril del Chaco árido argentino. Zootecnia tropical, **2008**, 26(2), 105-115.
- Dadé, M.M.;Fioravanti, D.E.;, Schinella, G.R. Tournier H,A. Total antioxidant capacity and polyphenol content of 21 aqueous extracts obtained from native plants of Traslasierra valley (Argentina). BolLatinoam Caribe,**2009**, 8, 529-539.
- Peralta, B. I. N. *Larrea divaricata* Cav.: Estudio de la actividad antioxidantefrenteaestrésoxidativoinducido y estudio de los parámetros farmacocinéticos (Doctoral dissertation, Universidad de Buenos Aires, Argentina, **2019**._Borneo, R.; León, A.; Aguirre, A.;Ribotta, P.;Cantero, J. Antioxidant capacity of medicinal plants from de province of Córdoba (Argentina) and their *in vitro* testing in a model food system. Food Chem,**2009**, 112, 664-670.