

Genista tridentata Phytochemical Characterization

Subjects: Biochemistry & Molecular Biology

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Genista tridentata (L.) Willk., known as “prickled broom”, is a Leguminosae (Fabaceae) species native to the Iberian Peninsula, Morocco, Algeria, and Tunisia. It is used in folk medicine as an anti-inflammatory, for gastrointestinal and respiratory disorders, rheumatism, and headaches, to lower blood pressure, against hypercholesterolemia and hyperglycemia.

Keywords: traditional medicine ; biological properties ; *Genista tridentata* ; *Pterospartum tridentatum* ; nutraceuticals

1. Introduction

Wild edible plants are an important piece of the cultural and genetic heritage of distinct world regions, representing high importance, predominantly in rural and suburban areas ^[1]. Furthermore, they are interesting sources of bioactive compounds and need recognition as considerable contributors to human health promotion and disease prevention ^[2].

Genista tridentata (L.) Willk. (the recognized name for this species), also known as *Pterospartum tridentatum* (L.) Willk. (the commonly used name in both scientific literature and commercially available extracts. Among other synonyms, *Chamaespartum tridentatum* (P.) Gibbs is also used ^{[3][4]}). Commonly known as “prickled broom”, it is a Leguminosae (Fabaceae) species belonging to the subfamily Papilionoideae ^{[5][6]}. In line with scientific literature and the Global Biodiversity Information Facility database ^[7], the recorded countries of origin for the plant remain consistent, comprising Portugal, Spain, and Morocco. However, it is important to mention that the Plants of the World Online (POWO) database ^[8] also lists Algeria and Tunisia as potential countries of origin for this plant. This shrub can be found in the understory of *Arbutus unedo*, *Pinus*, and *Eucalyptus* forests, as well as in abandoned lands. It grows spontaneously up to 100 cm in acidic soils ^[9] and presents yellow flowers with a typical odor in alternate branches and coriaceous winged stems ^[10]. Traditionally, it is harvested in the spring between March and June.

G. tridentata is an aromatic plant that is very important in Portuguese gastronomy. The leaves are conventionally used as a condiment/spice for the seasoning of traditional rice and meat dishes ^[11]. Moreover, fresh or shade-dried flowers of *G. tridentata* are also used in folk medicine, in infusions, decoctions, and tonics ^[12] as anti-inflammatory ^{[13][14][15]}, diuretic and depurative of the liver ^{[5][11][16][17]}. It is commonly used to ameliorate colds ^{[5][18]}, in digestive disorders ^{[5][18][19][20]}, intestinal ^{[21][22]} and urologic problems ^{[5][11][15][16][18]}, and rheumatism ^{[5][11][16]}. Additionally, it is also used for respiratory disorders ^{[5][6][13][15][18][23]}, headaches ^[5], to lower blood pressure ^{[5][6][18]}, against hypercholesterolemia ^{[5][6][18][20][22]} and hyperglycemia ^{[5][6][11][16][17][18][23][24]}, and in weight loss programs ^[5].

2. Phytochemical Characterization

The main compounds found are flavonoids, as well as hydroxycinnamic acids and hydroxybenzoic acids (**Table 1, Figure 1**). Additionally, extracts collected in the flowering period (May), as well as flowers, presented a more diverse phytochemical profile than extracts collected during the rest of the year.

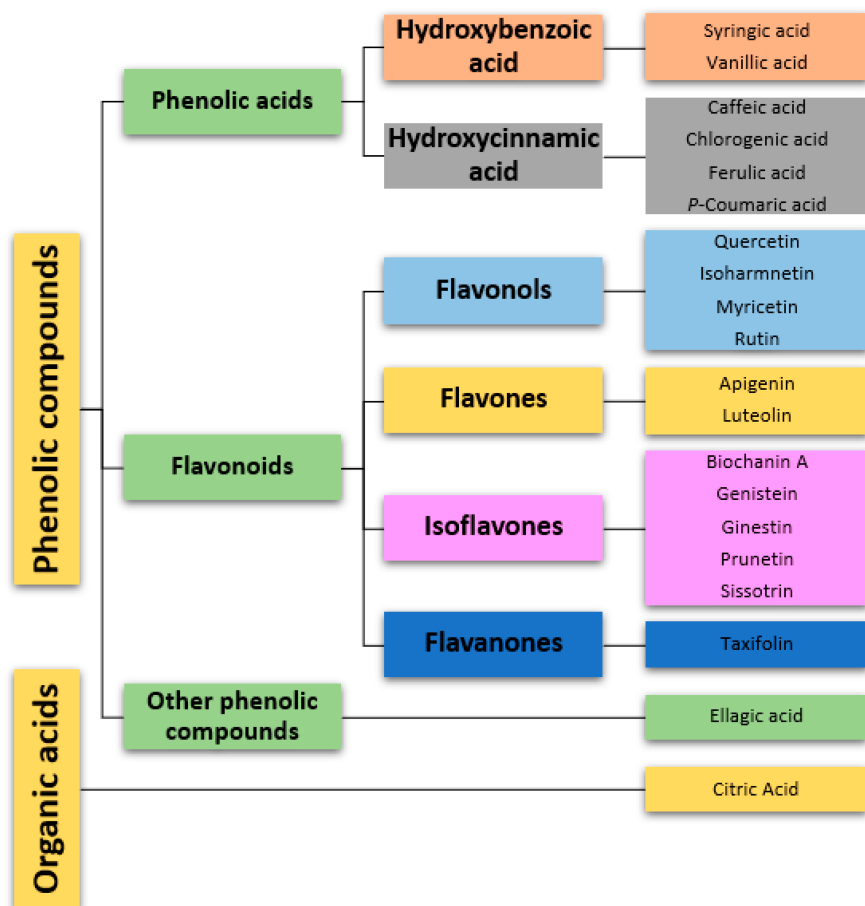


Figure 1. Classification of phytochemical compounds identified in *Genista tridentata*. Each distinct category is associated with a unique color.

Table 1. Major biologically active compounds were found in several samples of *G. tridentata* (X—detected; NA—not available; ND—not detected).

Authors	[17]	[23]		[9]	[15]	[20]	[25]		[26]	[27]	[28]						[8]	[22]	[15]		[27]	[28]
Extraction method	Methanolic					Aqueous												Ethanolic		NA		
Part plant used	Crude	flowers	Stems and leaves			Flowers				Aerial parts				In vitro culture		Leaves + Flowers	NA	Flowers	Flowers			
Sampling localization	Vila Real	Serra da Estrela	Serra da Estrela	Cinfães	Montesinho	Herbal Shop—DIÉTICA®	Malcata	Gardunha	Cinfães	Herbal Shop—Ervital	Viseu	Malcata	Gardunha	Malcata	Gardunha	Herbal shop—Ervital	Herbal Shop—DIÉTICA®	Montesinho	Viseu	Herbal shop—Ervital		
Sampling period	NA				Spring 2019	NA	May	May	NA	Spring 2012	NA	February	May	February	May	NA			Spring 2019	NA	Spring 2012	
5,5'-Dihydroxy-3'-methoxy-isoflavone-7-O-β-glucoside	ND	ND	ND	X	ND	ND	X	X	ND	X	ND	X	X	X	X	X	ND	ND	ND	ND	X	
5,5'-Dihydroxy-3'-methoxyisoflavone	ND	ND	ND	ND	X	ND	ND	ND	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	ND	ND	
7-Methylorobol	ND	ND	ND	ND	ND	ND	X	ND	X	X	ND	ND	ND	X	X	X	ND	ND	ND	ND	X	
Apigenin 5,7-dimethyl	ND	ND	ND	ND	ND	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Apigenin 5,7-dimethyl ether 4'galactoside	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	ND	ND	ND	
Biochanin A	X	ND	ND	ND	ND	X	ND	ND	ND	X	ND	ND	ND	ND	ND	ND	ND	X	ND	ND	X	

Authors	[27]	[29]	[8]	[15]	[26]	[24]	[25]	[26]	[27]	[24]												[6]	[22]	[19]	[27]	[28]
Biochanin A O-acetylhexoside-O-hexoside	ND	ND	ND	ND	ND	ND	ND	ND	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	X
Biochanin A O-hexoside	ND	ND	ND	ND	ND	ND	ND	ND	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	X
Biochanin A O-hexoside-O-hexoside	ND	ND	ND	ND	ND	ND	ND	ND	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	X
Biochanin A-glucoside	X	ND	ND	ND	ND	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	ND	ND	ND	ND	ND	ND	ND
Caffeic acid	ND	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorogenic acid	ND	ND	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Citric acid	ND	ND	ND	ND	ND	ND	X	X	ND	ND	ND	ND	X	X	X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dihydroquercetin 6-C-hexoside	ND	ND	ND	ND	X	ND	ND	ND	ND	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	ND	ND	ND	X
Ellagic acid	ND	X	X	ND	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	ND	ND	ND	ND
Ferulic acid	ND	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Genistein-8-C-glucoside	ND	ND	ND	ND	ND	X	X	X	ND	X	ND	X	X	X	X	X	X	ND	X	ND	X	ND	ND	ND	ND	X
Genistein	X	ND	ND	ND	ND	ND	X	X	X	X	X	X	ND	ND	X	X	ND	ND	ND	ND	ND	X	X	ND	ND	X
Genistein derivatives	X	ND	ND	ND	X	ND	ND	ND	ND	ND	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	X	ND	ND	ND
Genistin	X	ND	ND	X	ND	ND	ND	ND	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	X
Isoquercitrin	ND	ND	ND	X	ND	X	X	X	X	X	X	ND	X	ND	X	X	X	ND	X	ND	X	ND	X	ND	X	X
Isorhamnetin-O-hexoside	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	ND	ND	ND	ND	ND	ND	ND
Luteolin-O-(O-acetyl)-glucuronide	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	ND	ND	ND	ND	ND	ND	ND
Luteolin-O-glucuronide	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	ND	ND	ND	ND	ND	ND	ND
Methylbiochanin A/methylprunetin	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	X
Methylbiochanin A/methylprunetin derivative	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	X
Methylbiochanin A/methylprunetin O-hexoside	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	X
Myricetin-6-C-glucoside	ND	ND	ND	ND	X	X	X	X	X	X	ND	X	X	X	X	X	X	ND	X	X	-	X				X
p-Coumaric acid	ND	ND	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pentahydroxy-flavonol-di-O-glucoside	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	ND	ND	ND	ND	ND	ND	ND	ND
Prunetin	ND	ND	ND	X	ND	ND	X	ND	X	ND	ND	ND	ND	ND	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	X

Other compounds found in the literature include essential oils (EOs) (Table 2). Grosso et al. (2007) [14] studied the EOs isolated by hydrodistillation and distillation-extraction of flowers, stems and leaves, and aerial parts of different populations. Another study [29] also characterized EOs of *G. tridentata* using the same methodology. The results show that *G. tridentata* samples presented a yellowish oil with a yield of <0.05% (v/w). The dominant components of the oils were phenylpropanoids, more abundant in aerial parts, and oxygen-containing monoterpenes in the flowers, stems, and leaves. Additionally, Faria et al. (2013, 2016) [30][31] reported cis-theaspirane and trans-theaspirane as the main components.

Table 2. Composition (%) of the essential oils of *G. tridentata* isolated by hydrodistillation, collected in different years and locations. (AMF02: Flowers, collected in Arneiro das Milhariças in 2002; AMF03: collected in Arneiro das Milhariças in 2003; AML02: collected in Arneiro das Milhariças in 2002; AML03: collected in Arneiro das Milhariças in 2003; PAPN: collected in Pedra de Altar, Proença a nova; PSFPN: collected in Póvoa, Sobreira Formosa, Proença a nova; SCB: collected in Sarzeda, Castelo Branco; MCSB: collected in Milhasa do Corvo, Sarzeda, Castelo Branco; ND—not detected).

Components	Authors	Flowers			Leaves + Stems		Aerial Parts				
		[11]			[29]		[11]				
		RI	AMF02	AMF03	Herbal Shop	AML02	AML03	PAPN	PFSPNa	PFSPNb	SCB
<i>trans</i> -2-Hexenal	866	1.6	0.5	0.1	ND	1.6	ND	ND	1.7	3.2	ND
<i>cis</i> -3-Hexen-1-ol	868	1.6	1.2	ND	ND	5.3	ND	ND	0.8	3	ND
<i>cis</i> -2-Hexen-1-ol	882	1.5	1.2	ND	ND	0.8	ND	ND	0.6	1.2	ND
<i>n</i> -Hexanol	882	0.5	1.6	ND	ND	1.1	ND	ND	1.1	0.7	ND
<i>n</i> -Heptanal	897	11.8	4.8	0.9	ND	0.5	0.8	ND	ND	0.3	ND
<i>n</i> -Nonane	900	ND	ND	ND	ND	0.2	ND	ND	2.3	0.2	ND
Benzaldehyde	927	0.5	0.8	0.3	ND	0.6	1	ND	0.6	0.1	ND
α-Pinene	930	ND	0.3	0.3	ND	0.8	ND	ND	0.5	0.1	ND
<i>n</i> -Heptanol	952	0.5	1.6	ND	ND	1.5	ND	ND	ND	ND	1.3

Authors	[17]	[23]	[8]		[15]	[20]	[24]	[25]	[26]	[27]	[24]	[6]		[22]	[15]	[27]	[28]								
Components	Quercetin deoxyhexosyl-hexoside	ND	ND	ND	ND	X	ND	ND	ND	X	ND	ND	ND	ND	ND	ND	X	ND	X						
	Quercetin-3-O-rutinoside	ND	ND	ND	ND	X	ND	ND	ND	X	ND	ND	ND	ND	ND	ND	X	ND	X						
	Quercetin derivatives	ND	ND	ND	ND	X	ND	ND	ND	ND	X	ND	ND	ND	ND	ND	X	X	ND						
	1-Octen-3-ol	ND	ND	961	ND	10.7	ND	21	X	9.2	ND	11.5	ND	22.6	X	1.7	X	29.7	X	15	ND	25.8	ND	36.8	ND
2-Pentyl furan	Rosmarinic acid	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	ND	ND	X	ND	ND	ND	ND	1.4	ND
	Sisotrin	ND	ND	ND	X	ND	ND	X	X	X	ND	ND	ND	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	X
n-Octanal	Syringic acid	ND	X	ND	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Taxifolin	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3-Octanol	Taxifolin-6-C-glucoside	ND	ND	974	ND	1.4	ND	1.5	X	ND	1.9	ND	ND	X	X	X	ND	ND	ND	X	0.3	ND	ND	ND	1.5
	Benzyl alcohol	X		996	ND	ND	ND	ND	ND	0.3	ND	0.4	ND	ND	ND	ND	ND	ND	ND	0.3	ND	ND	ND	ND	ND
Benzene acetaldehyde				1002		1.8		1.8		ND		0.3		1.2		ND		ND		0.4		1.4		0.6	
p-Cymene				1003		ND		ND		0.3		ND		ND		ND		ND		ND		ND		ND	
1,8-Cineole				1005		0.9		1		0.7		1.1		0.2		ND		ND		ND		ND		ND	
Limonene				1009		0.9		1		ND		1.1		0.2		ND		ND		0.3		ND		ND	
Acetophenone				1017		ND		1.4		ND		2.1		0.5		ND		ND		ND		ND		ND	
n-Octanol				1045		0.5		0.4		0.7		2.1		0.3		0.6		ND		ND		ND		ND	
p-Cymenene				1050		ND		ND		0.6		ND		ND		ND		ND		ND		ND		ND	
Heptanoic acid				1056		0.5		1.2		ND		ND		0.4		ND		ND		ND		ND		2.1	
Phenyl ethyl alcohol				1064		0.7		1.2		ND		2		1.7		ND		3.6		3.3		3.4		6.3	
n-Nonanal				1073		14.5		6.1		6.5		4.6		0.9		10.5		4.1		0.2		0.9		1	
Linalol				1074		2.9		0.5		7.1		ND		2		ND		5.2		ND		2.3		1	
cis-Rose oxide				1083		2.9		0.5		ND		ND		ND		2		ND		5.2		2.3		1	
Camphor				1095		ND		ND		0.7		ND		ND		ND		ND		ND		ND		ND	
n-Undecane				1100		ND		ND		ND		ND		ND		ND		1		2.3		0.2		ND	
trans-Rose oxide				1100		ND		ND		ND		2.1		0.7		ND		1		ND		ND		ND	
trans-Pinocarveol				1106		ND		ND		0.3		ND		ND		ND		ND		ND		0.2		ND	
2- trans,6 cis-Nonadienal				1106		2.1		0.3		0.2		ND		ND		ND		ND		ND		ND		ND	
2- trans-Nonen-1-al				1114		0.5		0.4		ND		2.2		0.2		ND		ND		ND		ND		ND	
Pentyl benzene				1119		1.5		ND		ND		ND		0.3		ND		ND		ND		ND		ND	
Menthone				1120		ND		ND		0.2		ND		ND		ND		ND		ND		ND		ND	
Benzyl acetate				1123		ND		ND		0.2		ND		ND		ND		ND		ND		ND		ND	
Borneol				1134		ND		ND		1.1		ND		ND		ND		ND		ND		ND		ND	
Lavandulol				1142		ND		ND		0.3		ND		ND		ND		ND		ND		ND		ND	
Menthol				1148		ND		ND		0.5		ND		ND		ND		ND		ND		ND		ND	
Terpinen-4-ol				1148		ND		ND		0.7		ND		ND		ND		ND		ND		ND		ND	
Octanoic acid				1156		0.3		ND		0.5		0.5		ND		ND		ND		ND		ND		ND	
α-Terpineol				1159		ND		ND		1.8		ND		ND		ND		1.2		0.8		0.3		ND	
Safranal				1160		1.4		0.3		ND		ND		0.5		ND		ND		ND		ND		ND	

Components	Flowers				Leaves + Stems		Aerial Parts				
	Authors	^[11]		^[29]	^[11]						
	RI	AMF02	AMF03	Herbal Shop	AML02	AML03	PAPN	PFSPNa	PFSPNb	SCB	MCSB
Methyl chavicol (=estragole)	1163	ND	ND	0.9	ND	ND	ND	ND	ND	ND	ND
<i>n</i> -Decanal	1180	ND	0.3	0.4	ND	ND	ND	ND	ND	ND	ND
Pulegone	1210	ND	ND	1.4	ND	ND	ND	ND	ND	ND	ND
Geraniol	1236	0.3	1.6	0.6	4	9.2	3.2	1	-	1.4	2.8
Linalyl acetate	1245	ND	ND	1.4	ND	ND	ND	ND	ND	ND	ND
<i>Trans</i> -Anethole	1254	ND	ND	4.7	ND	ND	ND	ND	ND	ND	ND
<i>n</i> -Decanol	1259	0.3	1.6	0.6	4	0.2	3.2	3.4	2.5	3.2	1.9
2-Undecanone	1273	ND	ND	2.2	ND	ND	ND	ND	ND	ND	ND
Perilla alcohol	1274	ND	ND	ND	ND	3.4	ND	ND	ND	0.6	ND
Nonanoic acid	1274	ND	0.3	1.5	2.3	ND	ND	ND	ND	ND	ND
<i>cis</i> -Theaspirane	1279	1.6	2.2	ND	12.7	7.1	14.2	5.3	13.2	9	6.2
2 <i>trans</i> ,4 <i>trans</i> -Decadienal	1285	0.8	1.3	ND	ND	0.1	ND	1.8	ND	2	ND
<i>cis</i> -Transpirane	1286	ND	ND	3.2	ND	ND	ND	ND	ND	ND	ND
Carvacrol	1286	ND	ND	0.3	ND	ND	ND	ND	ND	ND	ND
2- <i>trans</i> -4- <i>trans</i> -Decadienal	1286	ND	ND	1	ND	ND	ND	ND	ND	ND	ND
<i>trans</i> -Theaspirane	1300	2.4	1.9	3.9	12.1	6.8	17.2	6.3	13.6	10	5.5
Hexyl tiglate ester	1316	ND	ND	0.2	ND	ND	ND	ND	ND	ND	ND
Eugenol	1327	1.4	1.7	0.8	3.5	2.6	ND	3.1	3	3.2	3.6
α-Terpenyl acetate	1334	ND	ND	0.3	ND	ND	ND	ND	ND	ND	ND
α-Longipinene	1338	ND	ND	0.1	ND	ND	ND	ND	ND	ND	ND
Decanoic acid	1350	ND	ND	0.8	ND	ND	ND	ND	ND	ND	ND
<i>trans</i> -β-Dasmascenone	1356	ND	ND	0.8	ND	ND	ND	ND	ND	ND	ND
Geranyl acetate	1370	ND	ND	0.5	ND	ND	ND	ND	ND	ND	ND
α-Copaene	1375	ND	ND	ND	ND	ND	ND	0.9	ND	ND	ND
β-Bourbonene	1379	ND	ND	ND	ND	ND	ND	1.5	ND	1.1	ND
2-Pentadecanone	1390	ND	ND	0.8	ND	ND	ND	ND	ND	ND	ND
Longifolene	1399	ND	ND	ND	ND	ND	ND	1.4	ND	ND	ND
β-Caryophyllene	1414	ND	0.4	1.2	ND	ND	ND	2.7	ND	2	0.9
Geranyl acetonea	1434	ND	3.6	0.7	ND	ND	ND	1.2	ND	0.6	ND
allo-Aromadendrene	1456	ND	ND	0.7	ND	ND	ND	ND	ND	ND	ND
<i>trans</i> -β-Ionone	1456	ND	ND	1.1	ND	ND	ND	ND	ND	ND	ND
Germacrene-D	1474	ND	0.2	ND	ND	ND	9.7	3.3	ND	0.7	ND

Components	Flowers				Leaves + Stems		Aerial Parts				
	Authors	[11]		[29]	[11]						
	RI	AMF02	AMF03	Herbal Shop	AML02	AML03	PAPN	PFSPNa	PFSPNb	SCB	MCSB
α -Curcumene	1475	ND	ND	0.5	ND	ND	ND	ND	ND	ND	ND
γ -Cadinene	1500	ND	3.3	ND	ND	ND	ND	1.2	ND	1.1	1.9
σ -Cadinene	1505	ND	2.4	ND	ND	ND	ND	1.6	ND	2	1.9
Dodecanoic acid	1551	3.5	2.1	5.3	2.6	0.3	15	ND	ND	0.9	1.1
β -Caryophyllene oxide	1561	ND	ND	ND	ND	ND	ND	1.3	ND	1.2	2.9
<i>n</i> -Tetradecanal	1596	ND	ND	ND	ND	ND	ND	1.1	ND	2.7	1.5
<i>n</i> -Pentadecanal;	1688	ND	ND	ND	ND	ND	ND	ND	ND	0.8	ND
Tetradecanoic acid	1734	ND	ND	0.2	ND	ND	ND	ND	ND	ND	ND
References											
Hexadecanoic acid	1779	ND	ND	0.7	ND	ND	ND	ND	ND	ND	ND
1. Pinela, J.; Carvalho, A.M.; Ferreira, I.C. Wild edible plants: Nutritional and toxicological characteristics, retrieval strategies and importance for today's society. Food Chem. Toxicol. 2017, 110, 165–188.											
Octadecadienoic acid	1820	ND	ND	0.4	ND	ND	ND	ND	ND	ND	ND
2. Demasi, S.; Caser, M.; Donno, D.; Enri, S.R.; Lonati, M.; Scariot, V. Exploring wild edible flowers as a source of bioactive compounds: New perspectives in horticulture. Folia Hort. 2021, 33, 27–48.											
% of identified components		71.8	75.1	71.8	78.4	76.8	77.1	82.9	64.8	88.5	82.2
3. Pinto, D.C.; Simões, M.A.; Silva, A.M. Genista tridentata L.: A rich source of flavonoids with anti-inflammatory activity. Medicines 2020, 7, 31.											
Grouped components											
Monoterpene hydrocarbons	0.9	1.3	0.6	1.1	1	ND	ND	0.8	0.1	ND	ND
Oxygen-containing monoterpenes	6.2	7	18.6	10.6	17.5	3.2	9.6	0.8	5.4	3.8	3.8
Sesquiterpene hydrocarbons	ND	6.3	2.5	ND	ND	9.7	12.6	ND	6.9	4.7	4.7
Oxygen-containing sesquiterpenes	ND	ND	7.1	ND	ND	ND	ND	ND	ND	1.2	2.9
Phenylpropanoids	1.4	1.7	6.4	3.5	2.6	ND	3.1	3	3.2	3.6	3.6
7. GBIF—Global Biodiversity Information Facility. Available online: https://www.gbif.org/search?q=Pterospartum tridentatum (accessed on 10 October 2023).											
0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%

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