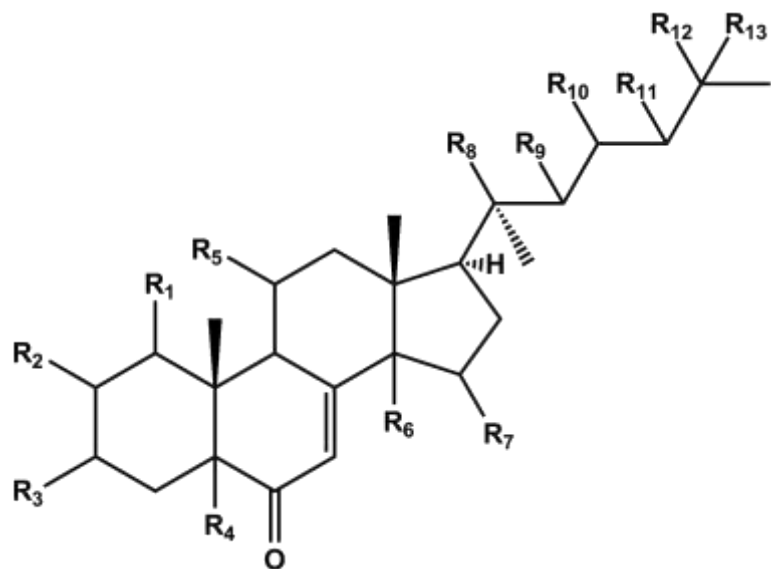


1. APPENDIX – TABLE 1: CHEMICAL COMPOSITION OF *RHAPONTICUM CARTHAMOIDES*

Table 1a: Constituents of *Rhaponticum carthamoides*: ecdysteroids I

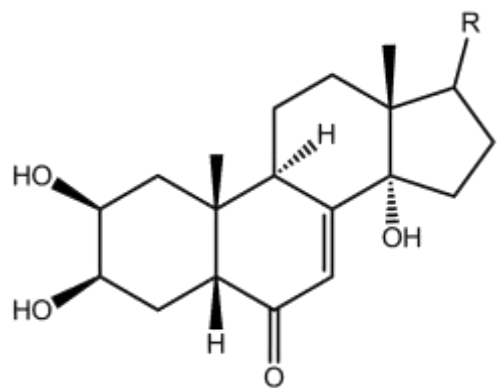


	Name	R ₁	R ₂	R ₃	R ₄	R ₅	R ₆	R ₇	R ₈	R ₉	R ₁₀	R ₁₁	R ₁₂	R ₁₃	Reference
1	20-OH-ecdysone	H	◀OH	◀OH	◀H	H	⋯OH	H	◀OH	⋯OH	H	H	—CH ₃	—OH	[7], [9]–[12]
2	α-Ecdysone	H	◀OH	◀OH	◀H	H	⋯OH	H	H	⋯OH	H	H	—CH ₃	—OH	[7], [13]
3	22-oxo-20-OH-ecdysone	H	◀OH	◀OH	◀H	H	⋯OH	H	◀OH	=O	H	H	—CH ₃	—OH	[7], [12]
4	3-epi-20-OH-ecdysone	H	◀OH	⋯OH	◀H	H	⋯OH	H	◀OH	⋯OH	H	H	—CH ₃	—OH	[7], [12]
5	5-α-20-OH-ecdysone	H	◀OH	◀OH	⋯H	H	⋯OH	H	◀OH	⋯OH	H	H	—CH ₃	—OH	[7], [12]
6	20-OH-ecdysone 2-acetate	H	◀OAc	◀OH	◀H	H	⋯OH	H	◀OH	⋯OH	H	H	—CH ₃	—OH	[7], [9]

7	20-OH-ecdysone 3-acetate	H				H		H			H	H			[7], [9]
8	Makisterone A	H				H		H			H				[7], [11], [12]
9	Makisterone C	H				H		H			H				[7], [9], [10], [12]
10	2-Deoxy-makisterone A	H	H			H		H			H				[7]
11	24-epi-makisterone A	H				H		H			H				[7], [9]
12	24(28)-dehydro-makisterone A	H				H		H			H				[7], [9], [10]
13	(24Z)-29-OH-24(28)-dehydro-makisterone C	H				H		H			H				[7], [9], [12]
14	22-Deoxy-28OH-makisterone C	H				H		H		H	H				[7], [9]
15	1β-hydroxy-makisterone C					H		H			H				[7], [9]
16	26-hydroxy-makisterone C	H				H		H			H				[7], [9]
17	Polypodine B	H				H		H			H	H			[7], [10]–[12]
18	Polypodine B-22-benzoate	H				H		H			H	H			[7], [13]
19	Integristerone A					H		H			H	H			[7], [9], [12]
20	Integristerone B					H		H			H	H			[7], [12]
21	Taxisterone	H				H		H		H	H	H			[7], [12]
22	Ajugasterone C	H						H			H	H		H	[7], [9]–[12], [14]
23	Lesterone	H						H			H	H			[7], [15]

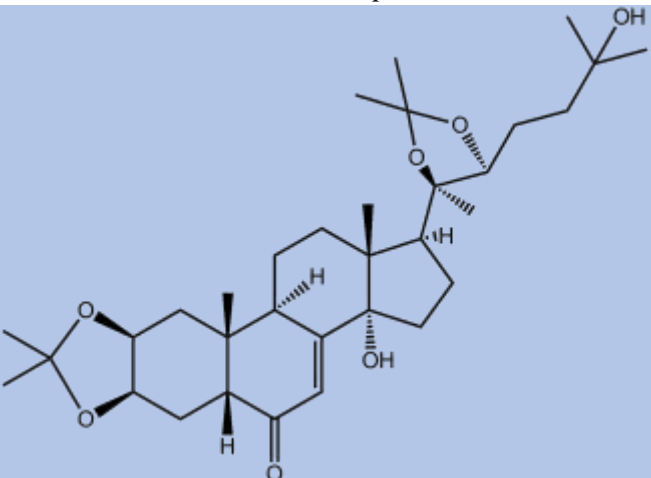
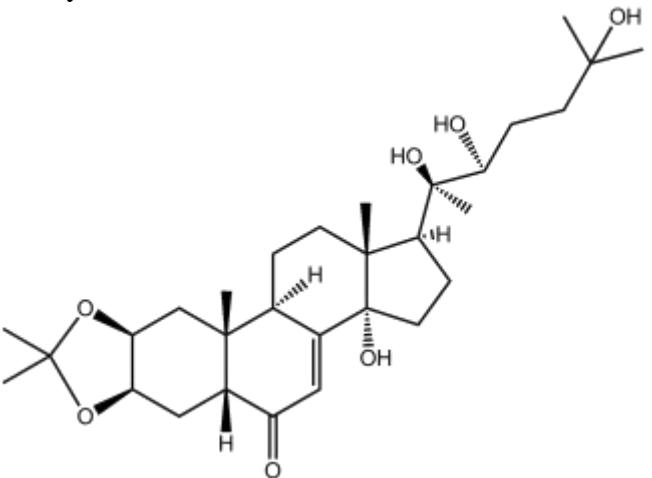
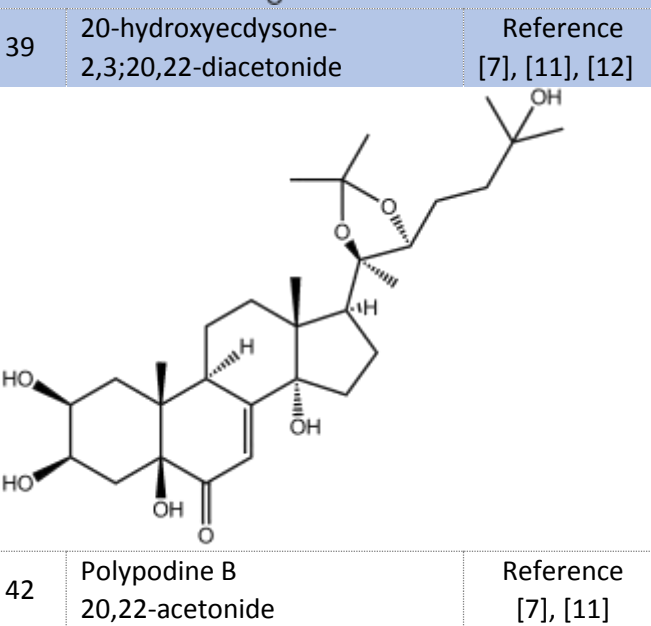
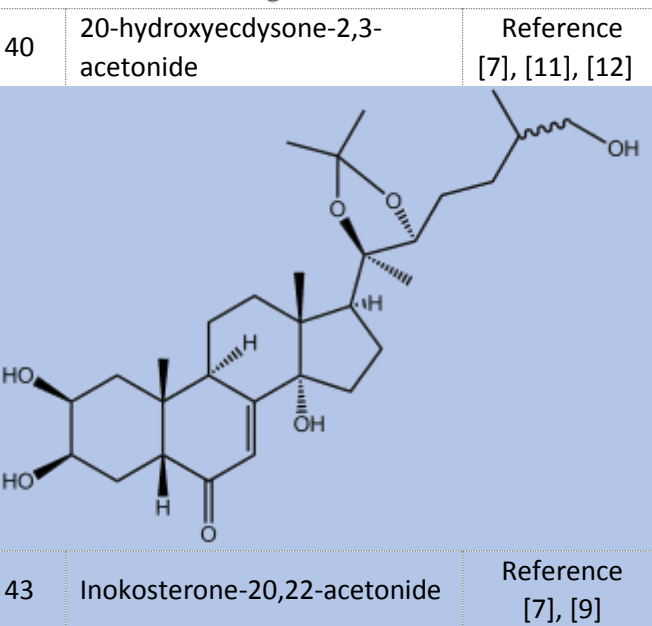

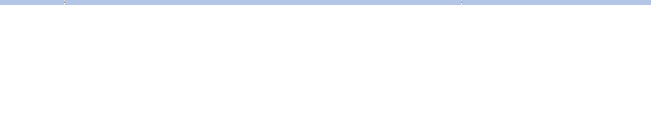
24	Inokosterone	H	▲OH	▲OH	▲H	H	⋯OH	H	▲OH	⋯OH	H	H	—CH ₂ OH	H	[7], [9]
25	Isovitexirone	H	▲OH	▲OH	▲H	⋯OH	⋯OH	H	▲OH	⋯OH	H	H	=O	H	[7], [11], [12]
26	Rapisterone	H	▲OH	▲OH	▲H	H	⋯OH	H	▲OH	⋯OH	∞ OH	—CH ₂ CH ₃	—CH ₃	H	[7]
27	Rapisterone B	H	▲OH	▲OH	▲H	⋯OH	⋯OH	H	▲OH	⋯OH	H	∞ OH	—CH ₃	H	[7], [16]
28	Rapisterone C	H	▲OH	▲OH	▲H	H	⋯OH	H	▲OH	⋯OH	—CH ₂ CH ₃	H	—CH ₃	—OH	[7], [17]
29	Rapisterone D	H	⋯OH	⋯OH	▲OH	H	⋯OH	H	▲OH	⋯OH	H	H	—CH ₃	—OH	[7], [18]
30	Rapisterone D 20-acetate	H	⋯OH	⋯OH	▲OH	H	⋯OH	H	▲OAc	⋯OH	H	H	—CH ₃	—OH	[7]
31	14-epi- ponasterone A 22-glucoside	H	▲OH	▲OH	▲H	H	▲OH	H	▲OH	⋯O-Glu	H	H	—CH ₃	H	[7], [9]
32	15-hydroxy- ponasterone A	H	▲OH	▲OH	▲H	H	⋯OH	▲OH	▲OAc	⋯OH	H	H	—CH ₃	H	[7], [9]
33	Turkesterone	H	▲OH	▲OH	▲H	⋯OH	⋯OH	H	▲OH	⋯OH	H	H	—CH ₃	—OH	[7], [9]
34	Amarasterone A	H	▲OH	▲OH	▲H	H	⋯OH	H	▲OH	⋯OH	H	—CH ₂ CH ₃	—CH ₂ OH	H	[7], [9]
35	24(28)-Dehydro- amarasterone B	H	▲OH	▲OH	▲H	H	⋯OH	H	▲OH	⋯OH	H		—CH ₃	H	[7], [9], [19]

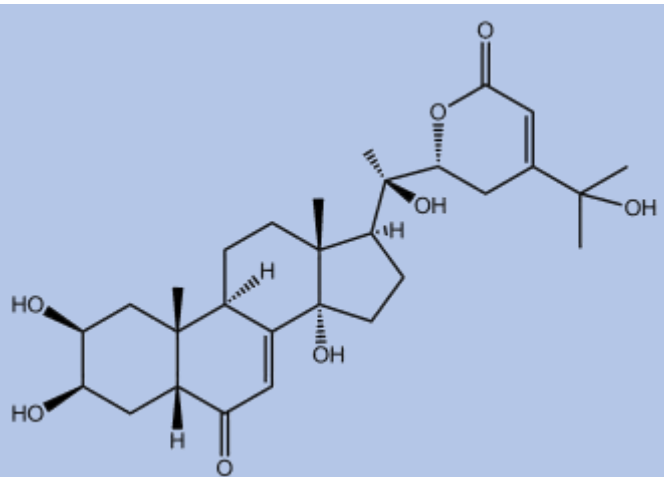
Table 1b: Constituents of *Rhaponticum carthamoides*: ecdysteroids II



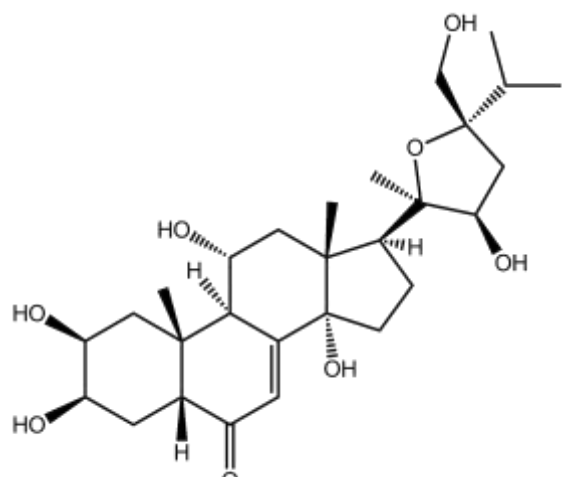
	Name	R	Reference
36	Rubrosterone	=O	[7], [12]
37	Dihydrorubrosterone	—OH	[7], [12]
38	Poststerone		[7], [12]

Table 1c: Constituents of *Rhaponticum carthamoides*: ecdysteroids III

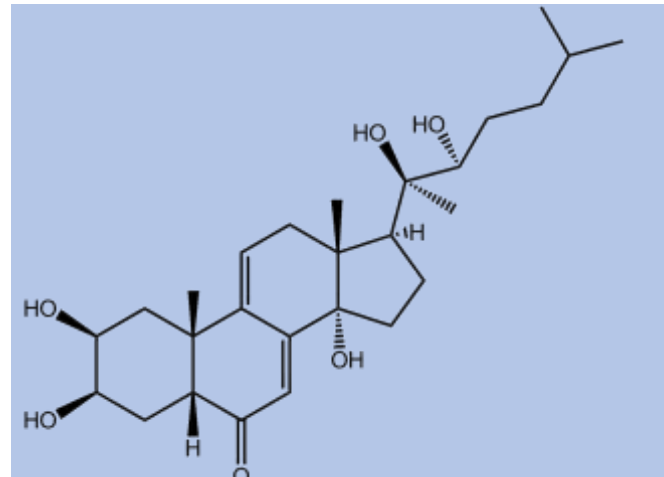
	<p>39</p> <p>20-hydroxyecdysone-2,3;20,22-diacetonide</p>	<p>Reference [7], [11], [12]</p>		<p>40</p> <p>20-hydroxyecdysone-2,3-acetonide</p>	<p>Reference [7], [11], [12]</p>
	<p>41</p> <p>Polypodine B 20,22-acetonide</p>	<p>Reference [7], [11], [12]</p>		<p>42</p> <p>20-hydroxyecdysone-20,22-acetonide</p>	<p>Reference [7], [11], [12]</p>
	<p>43</p> <p>Inokosterone-20,22-acetonide</p>	<p>Reference [7], [9]</p>		<p>44</p> <p>Integristerone A 20,22-acetonide</p>	<p>Reference [7], [9]</p>



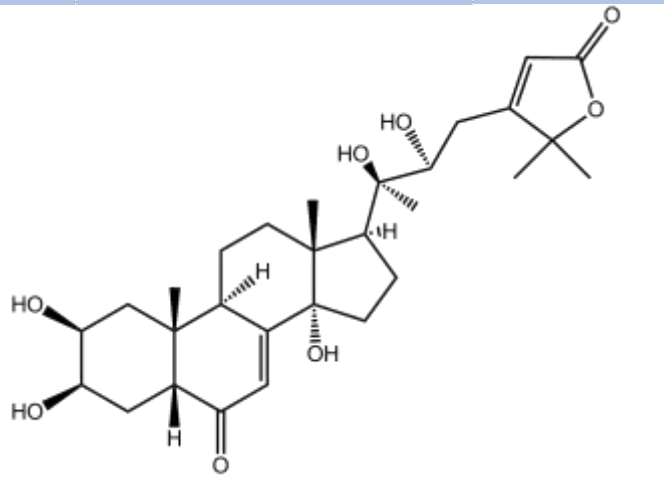
45 Leuzeasterone Reference [7], [12]



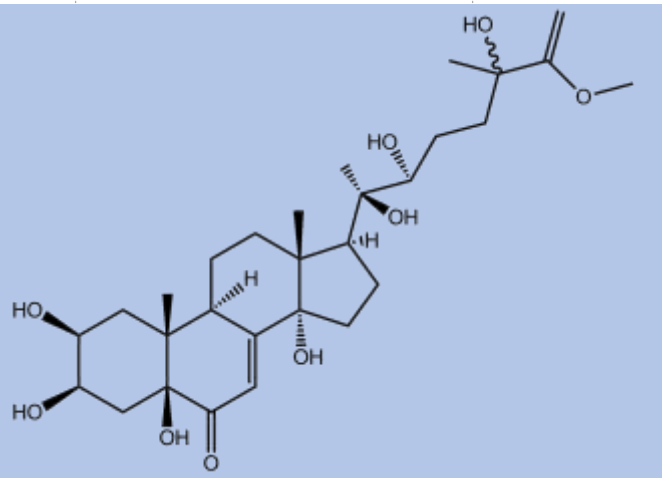
46 Carthamoleusterone Reference [7], [9]



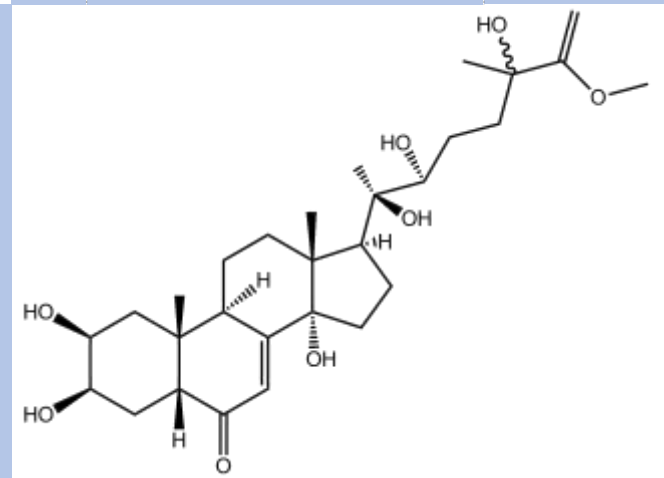
47 5-deoxykaladasterone Reference [10], [14]



48 Carthamosterone Reference [7], [10], [12]

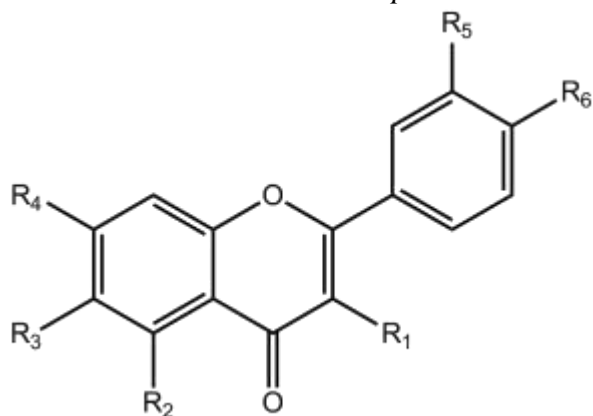


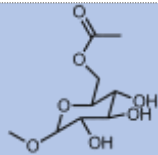
49 Carthamosterone A Reference [7], [20]



50 Carthamosterone B Reference [7], [21]

Table 1d: Constituents of *Rhaponticum carthamoides*: flavonoids I



	Name	R ₁	R ₂	R ₃	R ₄	R ₅	R ₆	Reference
51	Kaempferol	—OH	—OH	H	—OH	H	—OH	[7], [22], [23]
52	6-Hydroxykaempferol-7-glucoside	—OH	—OH	—OH	—O-Glu	H	—OH	[7], [24]
53	6-Hydroxykaempferol-7-O-(6''-O-acetyl-β-D-glucopyranoside)	—OH	—OH	—OH		H	—OH	[7], [25], [26]
54	6-Hydroxykaempferol-7-O-β-glucopyranoside	—OH	—OH	—OH	—O-Glu	H	—OH	[7], [25]
55	6-Methoxykaempferol	—OH	—OH	—OCH ₃	—OH	H	—OH	[7], [24]
56	6-Methoxykaempferol-3-O-β-glucopyranoside	—O-Glu	—OH	—OCH ₃	—OH	H	—OH	[7], [25]
57	Quercimeritrin	—OH	—OH	H	—O-Glu	—OH	—OH	[7], [24]
58	Quercetagitrin	—OH	—OH	—OH	—O-Glu	—OH	—OH	[7], [24]
59	Quercetin	—OH	—OH	H	—OH	—OH	—OH	[7], [22]–[24]
60	Quercetin-3,3'-dimethyl ether	—OCH ₃	—OH	H	—OH	—OCH ₃	—OH	[7], [24], [27]
61	Quercetin-3-methylether	—OCH ₃	—OH	H	—OH	—OH	—OH	[7], [22], [24], [27]
62	Quercetin-5-O-β-D-galactoside	—OH	—O-Gal	H	—OH	—OH	—OH	[7], [27] [7], [28]

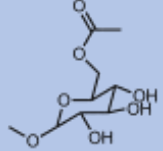
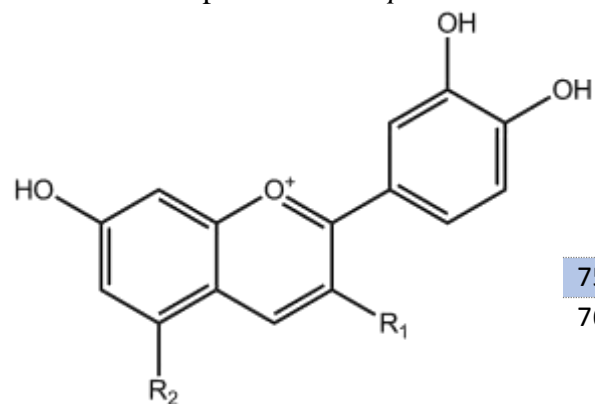
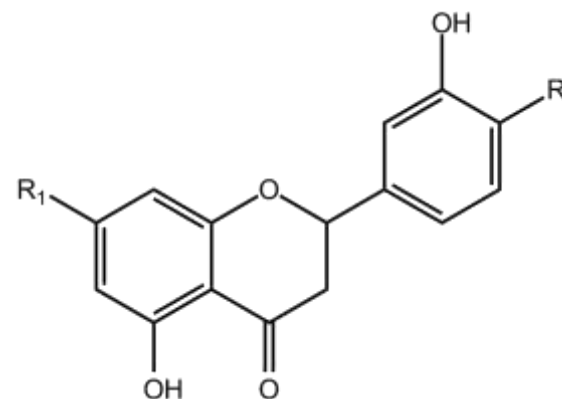
63	Quercetin-7-glucoside	—OH	—OH	H	—O-Glu	—OH	—OH	[24]
64	Quercetin-5-glucoside	—OH	—O-Glu	H	—OH	—OH	—OH	[7], [24]
65	Quercetagenin	—OH	—OH	—OH	—OH	—OH	—OH	[7], [22], [23]
66	Quercetagenin-7-O-β-glucopyranoside	—OH	—OH	—OH	—O-Glu	—OH	—OH	[7], [25]
67	Quercetagenin-7-O-(6''-O-acetyl-β-glucopyranoside)	—OH	—OH	—OH		—OH	—OH	[7], [25]
68	Isorhamnetin	—OH	—OH	H	—OH	—OCH ₃	—OH	[7], [22]–[24]
69	Isorhamnetin-5-glucoside	—OH	—O-Glu	H	—OH	—OCH ₃	—OH	[7], [24]
70	Isorhamnetin-5-O-α-L-rhamnoside	—OH	—O-Rha	H	—OH	—OCH ₃	—OH	[7], [28]
71	Patuletin	—OH	—OH	—OCH ₃	—OH	—OH	—OH	[7], [24], [26]
72	Patuletin-3'-β-xylofuranoside	—OH	—OH	—OCH ₃	—OH	—O-Xyl	—OH	[29]
73	Apigenin	H	—OH	H	—OH	H	—OH	[7], [22]
74	Luteolin	H	—OH	H	—OH	—OH	—OH	[7], [22], [23]

Table 1e: Compounds of *Rhaponticum carthamoides*: flavonoids II



	Name	R ₁	R ₂	Reference
75	Chrysanthemim	—O-Glu	—OH	[7], [23], [30]
76	Cyanin	—O-Glu	—O-Glu	[7], [23], [30]

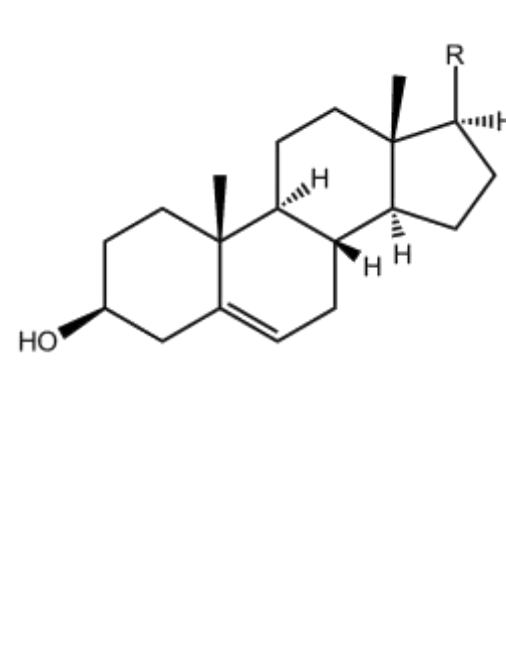
Table 1f: Compounds of *Rhaponticum carthamoides*: flavonoids III



The chemical structure shows a flavonoid core consisting of a chromone ring system (a benzene ring fused to a pyrone ring) with a phenyl ring attached at the 7-position. The phenyl ring has a hydroxyl group at the 4-position and a substituent R₂ at the 3-position. The chromone ring has a hydroxyl group at the 5-position and a substituent R₁ at the 6-position.

	Name	R ₁	R ₂	Reference
77	Hesperetin	—OH	—OCH ₃	[7]
78	Hesperetin-dirhamnoglycoside	—O-Rha-Glu	—OCH ₃	[23]
79	Eriodictyol	—OH	—OH	[7], [26]
80	Eriodictyol-7-β-glucopyranoside	—O-Glu	—OH	[7], [26]

Table 1g: Compounds of *Rhaponticum carthamoides*: sterols



The chemical structure shows a sterol core with four fused rings (three six-membered and one five-membered). It has a hydroxyl group at the 3-position, a double bond at the 5-position, and a side chain at the 17-position. The side chain is shown with a substituent R.

81	β-Sitosterol	Reference [7], [31]	82	Campesterol	Reference [7], [31]
83	Stigmasterol	Reference [7], [31]	84	Cholesterol	Reference [7], [31]
85	Δ ⁷ -Avanasterol	Reference [7], [31]			

Table 1h: Compounds of *Rhaponticum carthamoides*: lignans

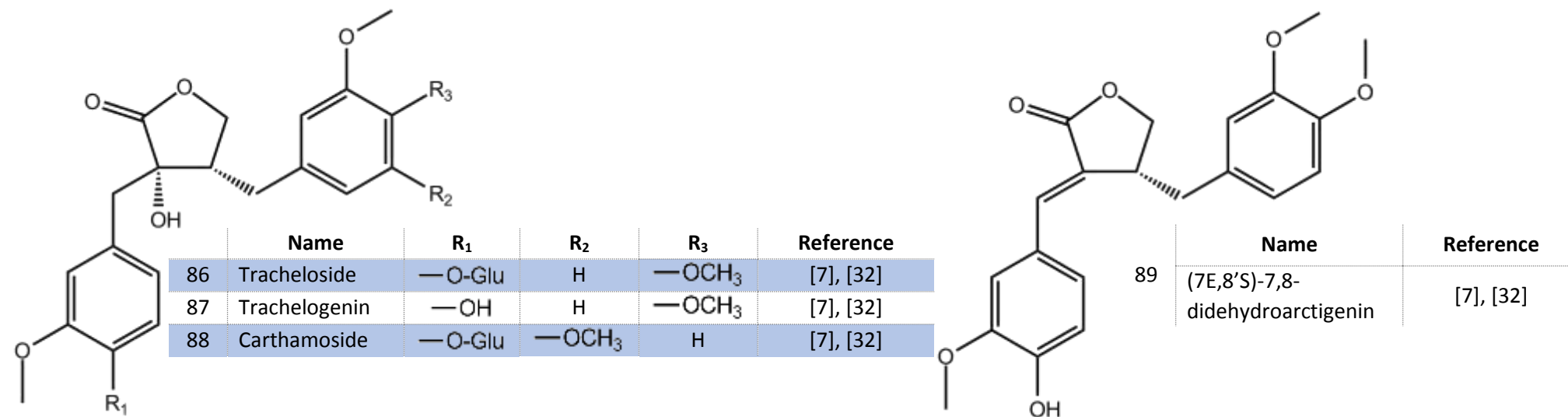


Table 1i: Compounds of *Rhaponticum carthamoides*: phenylpropenoids and stilbenes

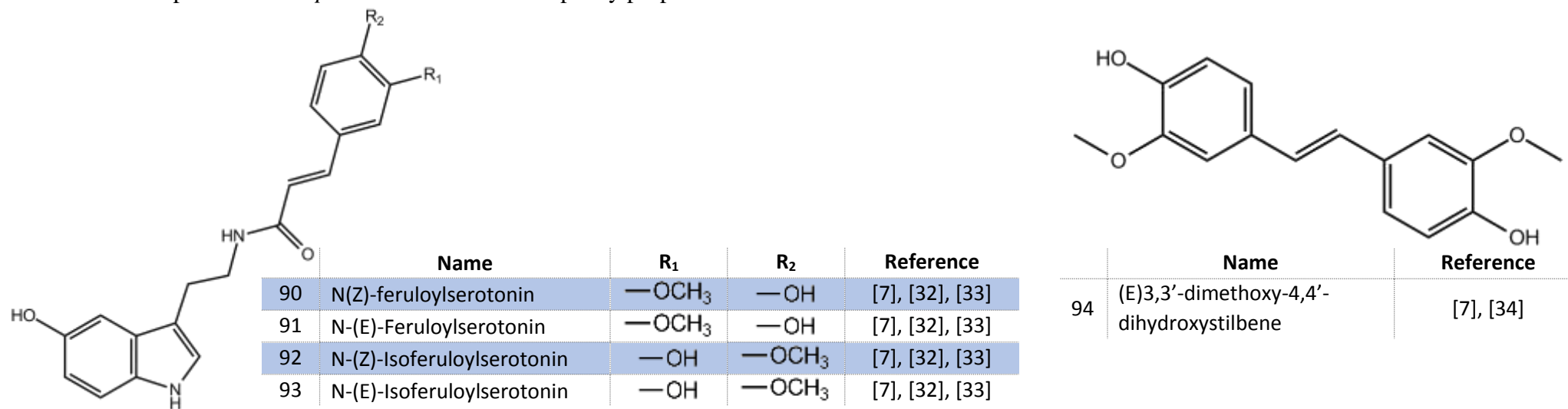
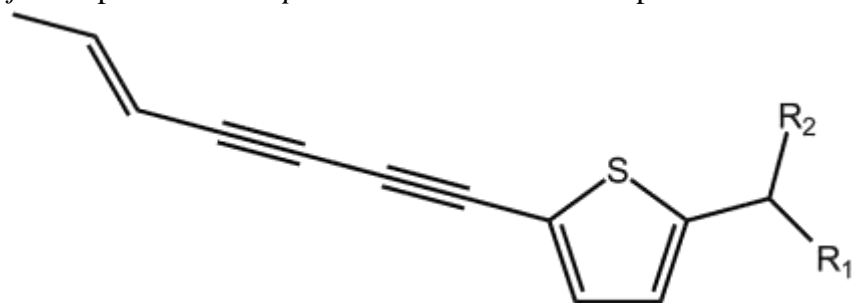


Table 1j: Compounds of *Rhaponticum carthamoides*: thiophene derivatives



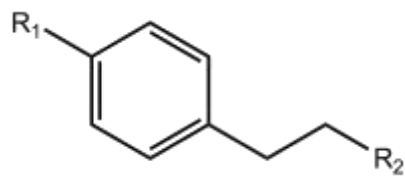
	R ₁	R ₂	Reference
95	—OH	H	[7], [35]
96	—OH	—CH ₂ OAc	[7], [35]
97	—CH ₂ OAc	—CH ₂ OAc	[7], [35]
98	—CH ₂ OAc	—OH	[7], [35]

Table 1k: Compounds of *Rhaponticum carthamoides*: terpenes and phenolic acids

	Phenolic acids	Reference		Terpenes	Reference
99	Benzoic acid	[7], [36]	119	α -Pinene	[6]
100	Chlorogenic acid	[7], [36]	120	β -Pinene	[6]
101	Salicylic acid	[7], [36]	121	1-p-Menthene	[6]
102	m-hydroxybenzoic acid	[7], [36]	122	Limonene	[6]
103	o-hydroxy-phenylacetic acid	[7], [36]	123	p-Cymen-8-ol	[6]
104	p-hydroxy-benzoic acid	[7], [36]	124	δ -Elemene	[6]
105	p-hydroxy-phenylacetic acid	[7], [36]	125	13-Norcypera-1(5),11(12)-diene	[6]
106	Vanillic acid	[7], [36]	126	Cyclosativene	[6]
107	Gentisic acid	[7], [36]	127	α -Copaene	[6]
108	Protocatechutic acid	[7], [36]	128	β -Elemene	[6]
109	Syringic acid	[7], [36]	129	Cyperene	[6]
110	p-coumaric acid	[7], [36]	130	α -Gurjunene	[6]
111	Gallic acid	[7], [36]	131	Dehydro isolongifolene	[6]
112	Ferulic acid	[7], [36]	132	β -Caryophyllene	[6]
113	Caffeic acid	[7], [36]	133	α -Guaiene	[6]
114	Synapic acid	[7], [36]	134	trans- β -Farnesene	[6]
115	o-coumaric acid	[7], [36]	135	β -Santalene	[6]
116	Neochlorogenic acid	[7]	136	Aromadendrene	[6]
117	Isochlorogenic acid a	[7]	137	γ -Hinachalene	[6]
118	Isochlorogenic acid b	[7]	138	Pentadec-1-ene	[6]
			139	α -Muurolene	[6]
			140	Hexadecatriene	[6]
			141	Caryophyllene oxide	[6]
			142	Heptadeca-1,8-diene	[6]
			143	Aplotaxene	[6]
			144	Selina-3,7-diene	[6]
			145	Rotundene	[6]
			146	β -Selinene	[6]
			147	α -Bulnesene	[6]
			148	7-epi- α -Selinene	[6]
			149	Cyanopicrin	[7], [8]
			150	Janerin	[7], [8]
			151	Chlorojanerin	[7], [8]
			152	Repiolide	[7], [8]
			153	Cebellin	[7], [8]

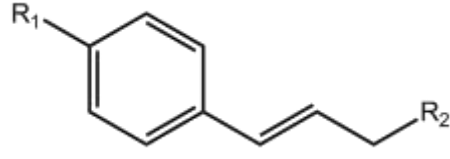
2. APPENDIX – TABLE 2: CHEMICAL COMPOSITION OF *RHODIOLA ROSEA*

Table 2a: Constituents of *Rhodiola rosea*: Phenylpropanoids



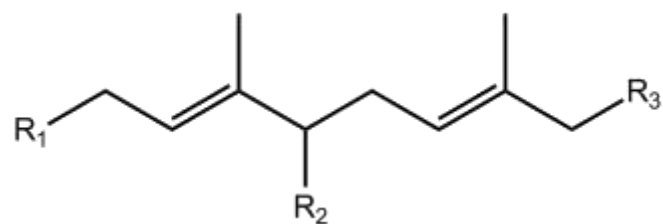
	Name	R ₁	R ₂	Reference
1	Heterodontoside	—OMe	—O-Glu _{pyr} -Xyl _{pyr}	[56]
2	p-Tyrosol	—OH	—OH	[56]–[58]
3	Salidroside	—OH	—O-Glu	[56], [58]–[61]
4	Viridoside	—OMe	—O-Glu	[56], [60]
5	Monghroside	—OMe	—O-Glu _{pyr} -Ara _{pyr}	[60]

Table 2b: Constituents of *Rhodiola rosea*: Phenylpropenoids



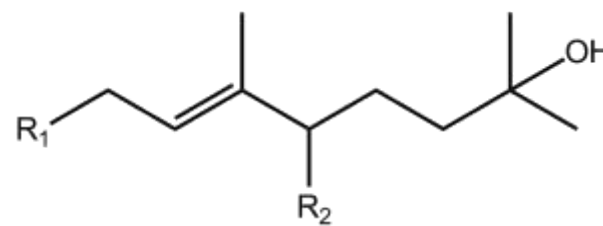
	Name	R ₁	R ₂	Reference
6	4-Methoxy-cinnamyl-O-β-D-glucopyranoside	—OMe	—O-Glu _{pyr}	[61]
7	4-Methoxy-cinnamyl-(6'-O-α-arabinopyranosyl)-O-β-glucopyranoside	—OMe	—O-Glu _{pyr} -Ara _{pyr}	[61]
8	Rosavin	H	—O-Glu _{pyr} -Ara _{pyr}	[58]–[62]
9	Rosin	H	—O-Glu _{pyr}	[58]–[62]
10	Rosarin	H	—O-Glu _{pyr} -Ara _{fur}	[58]–[62]
11	Cinnamyl-(6'-O-β-D-xylanopyranosyl)-O-β-D-glucopyranoside	H	—O-Glu _{pyr} -Xyl _{pyr}	[60], [61]
12	Sachaliside	—OH	—O-Glu _{pyr}	[61]

Table 2c: Constituents of *Rhodiola rosea*: Terpenoids I



	Name	R ₁	R ₂	R ₃	Reference
13	Rosiridol	—OH	—OH	H	[58], [63]
14	Rosiridine	—O-Glu _{pyr}	—OH	H	[58], [60], [63]
15	Geranyl-1-O-α-L-arabinopyranosyl (1-6)β-D-glucopyranoside	—O-Glu _{pyr} -Ara _{pyr}	H	H	[60]
16	Geranyl-1-O-α-L-arabinofuranosyl (1-6)β-D-glucopyranoside	—O-Glu _{pyr} -Ara _{fur}	H	H	[60]
17	Rhodioloside A	—O-Glu _{pyr}	◀OH	—OH	[64]
18	Rhodioloside B	—O-Glu _{pyr} -Glu _{pyr}	⋯OH	H	[64]
19	Rhodioloside C	—O-Glu _{pyr} -Glu _{pyr}	◀OH	H	[64]
20	Rhodioloside F	—O-Glu _{pyr} -Ara _{pyr}	◀OH	H	[60]

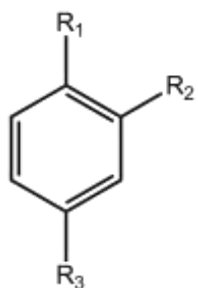
Table 2d: Constituents of *Rhodiola rosea*: Terpenoids II



The structure shows a terpenoid skeleton with a double bond between C2 and C3. C1 is substituted with R1. C4 is substituted with R2. C5 is substituted with a hydroxyl group (OH). The table below lists the specific substituents for three compounds.

	Name	R ₁	R ₂	Reference
21	Rhodioloside D	—O-Glu _{pyr}	◀OH	[64]
22	Rhodioloside E	—O-Glu _{pyr} -Ara _{pyr}	H	[64]
23	Sachalinol A	—OH	◀OH	[60]

Table 2e: Constituents of *Rhodiola rosea*: Monoterpene glycosides I




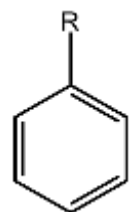
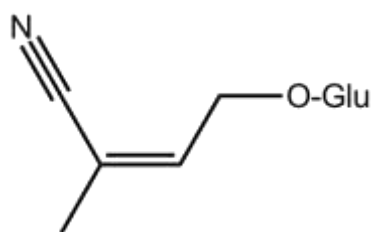
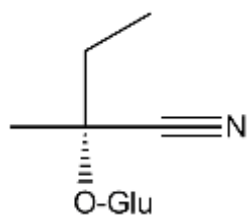
	Name	R ₁	R ₂	R ₃	Reference
24	Picein		H	—O-Glu _{pyr}	[61]
25	Phenylmethyl- <i>O</i> -α-L-arabinofuranosyl(1-6)-β-D-glucopyranoside	—O-Glu _{pyr} -Ara _{fur}	—CH ₃	H	[60]
26	2-Phenylmethyl-α-L-arabinopyranosyl(1-6)-β-D-glucopyranoside	—O-Glu _{pyr} -Ara _{pyr}	—CH ₃	H	[60]

Table 2f: Constituents of *Rhodiola rosea*: Monoterpene glycosides II

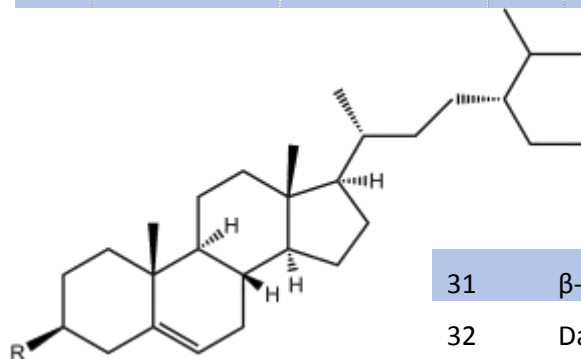


	Name	R	Reference
27	Benzyl- <i>O</i> - β -glucopyranoside	—O-Glu _{pyr}	[61]
28	Benzylalcohol- <i>O</i> - α -L-arabinopyranosyl (1-6)- β -D-glucopyranoside	—O-Glu _{pyr} -Ara _{pyr}	[60]

Table 2g: Constituents of *Rhodiola rosea*: Cyanogenic glycosides and sterols

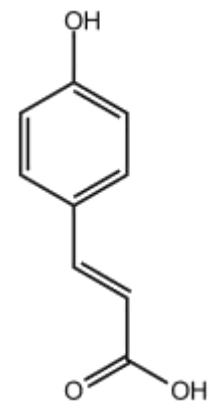
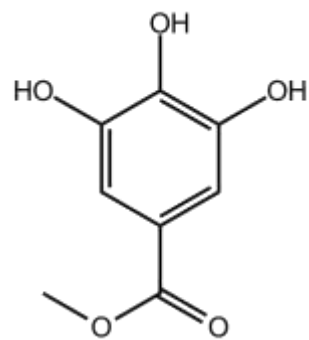
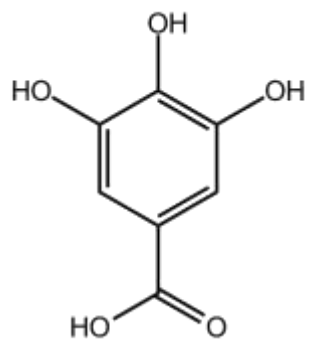


29	Lotaustralin	Reference [56], [59]	30	Rhodiocyanoside A	Reference [56]
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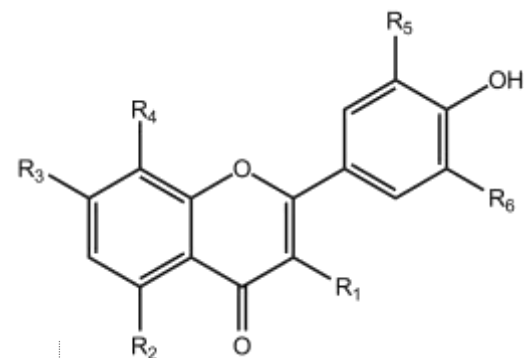
	Name	R	Reference
31	β -sitosterol	—OH	[58], [59]
32	Daucosterol	—O-Glu	[58], [63]

Table 2h: Constituents of *Rhodiola rosea*: Phenolic acids



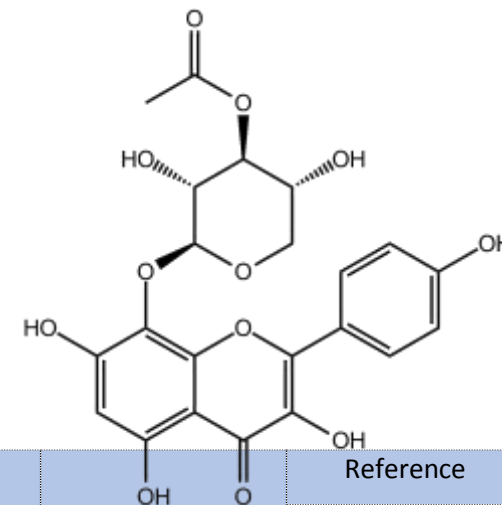
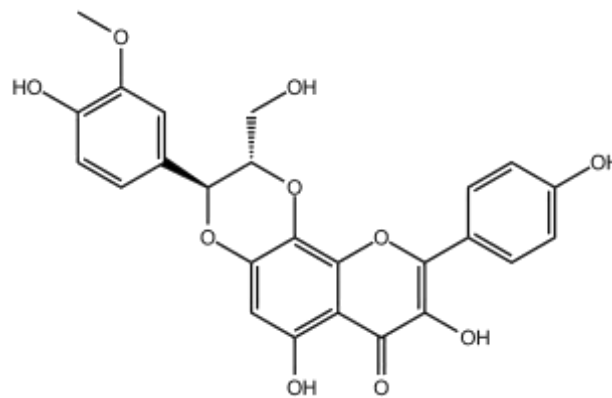
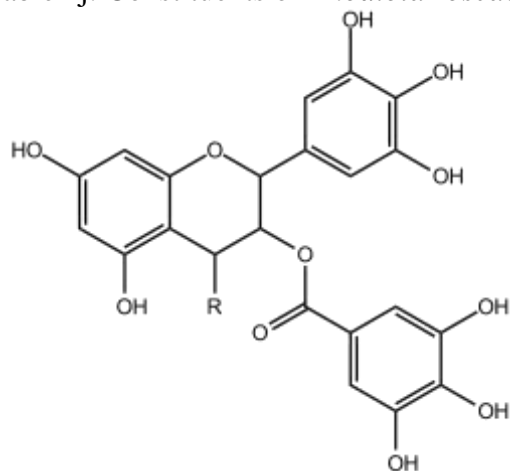
33	Gallic acid	Reference [57], [58]	34	Methylgallate	Reference [57]	35	trans-p-hydroxycinnamic acid	Reference [58]
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Table 2i. Constituents of *Rhodiola rosea*: Flavonoids I



	Name	R ₁	R ₂	R ₃	R ₄	R ₅	R ₆	Reference
36	Rhodiogin	—OH	—OH	—O-Rha	—OH	—OH	H	[57], [58]
37	Rhodioflavonoside	—OH	—OH	—O-Rha-Glu	—OH	—OH	H	[57]
38	Rhodianin	—OH	—OH	—O-Rha	—OH	H	H	[58], [65]
39	Rhodosin	—OH	—OH	—O-Rha-Glu	—OH	H	H	[58], [65]
40	Tricin	H	—OH	—OH	H	—OMe	—OMe	[58]
41	Tricin-5- <i>O</i> -glucoside	H	—O-Glu	—OH	H	—OMe	—OMe	[58]
42	Tricin-7- <i>O</i> -glucoside	H	—OH	—O-Glu	H	—OMe	—OMe	[58]
43	Kaempferol	—OH	—OH	—OH	H	H	H	[58]
44	Kaempferol-7- <i>O</i> -rhamnoside	—OH	—OH	—O-Rha	H	H	H	[58]
45	Kaempferol-3- <i>O</i> -β-D-xylopyranosyl (1-2)-β-D-glucopyranoside	—O-Glu-Xyl	—OH	—OH	H	H	H	[60]
46	Rhodalgin	—OH	—OH	—OH	—O-Rha	H	H	[58]
47	8-Methylherbacetin	—OH	—OH	—OH	—OMe	H	H	[58]
48	Rhodianidin	—OH	—OH	—O-Rha	—OMe	H	H	[58]
49	Rhodalidin	—O-Glu	—OH	—OH	—O-Xyl	H	H	[58]

Table 2j: Constituents of *Rhodiola rosea*: Flavonoids II



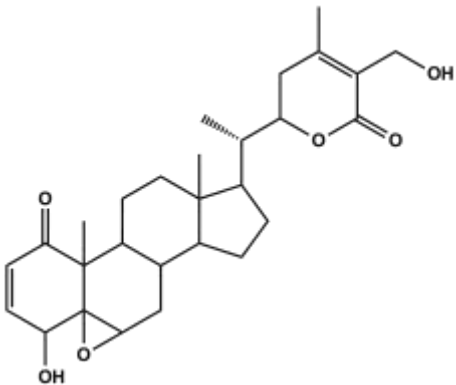
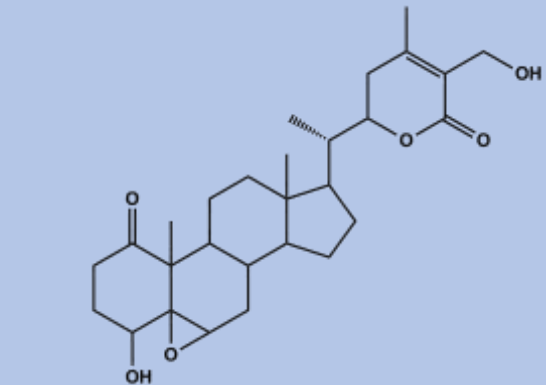
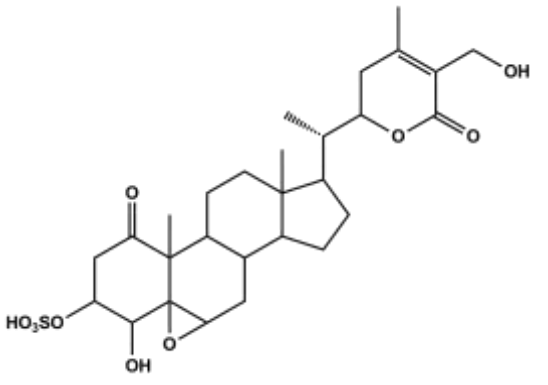
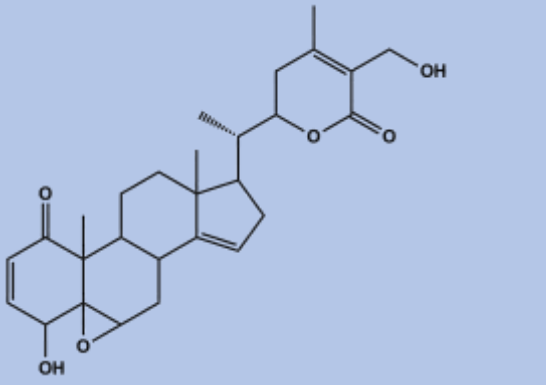
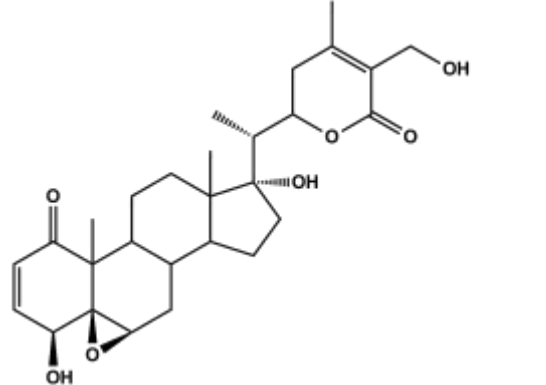
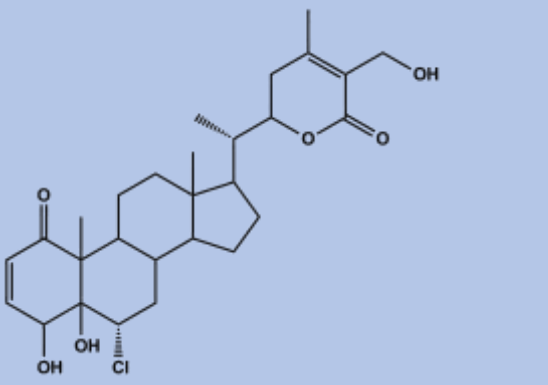
	Name	R	Reference			Reference		Reference	
50	Epigallocatechin-3-O-gallate (EGCG)	H	[56]	52	Rhodiolin	[58], [65]	53	AcetylRhodalgin	[58]
51	Epigallocatechin-3-O-gallate-4- β -benzylthioether		[56]						

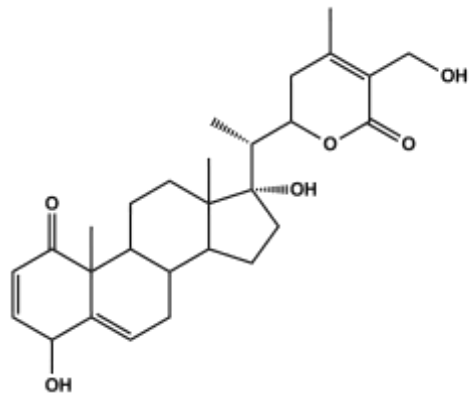
Table 2k: Constituents of *Rhodiola rosea*: Monoterpenes

	Name	Reference		Name	Reference
54	Santene	[66]	97	Neomenthol	[66]
55	Tricyclene	[66]	98	Myrtenal	[66]
56	α -pinene	[66]	99	Menthol	[66]
57	Camphene	[66]	100	trans-Pinocarveol	[66]
58	Hexanal	[66]	101	Neral	[66]
59	β -pinene	[66]	102	Estragol	[66]
60	Sabinene	[66]	103	n-Nonanol	[66]
61	3-Carene	[66]	104	α -terpineol	[66]
62	β -myrcene	[66]	105	Geranyl formate	[66]
63	α -terpiene	[66]	106	Carvone	[66]
64	2-heptanone	[66]	107	Geranial	[66]
65	Heptanal	[66]	108	Geranyl-acetete	[66]
66	Limonene	[66]	109	Cuminyaldehyde	[66]
67	β -phellandrene	[66]	110	Perilla-aldehyde	[66]
68	2-pentyl furan	[66]	111	n-Decanol	[66]
69	cis-Ocimene	[66]	112	Myrtenol	[66]
70	γ -terpiene	[66]	113	Nerol	[66]
71	trans-Ocimene	[66]	114	trans-Carveol	[66]
72	Styrene	[66]	115	cis-Carveol	[66]
73	n-Pentanol	[66]	116	Geraniol	[66]
74	p-Cymene	[66]	117	Hexanoic acid	[66]
75	Terpinolene	[66]	118	Benzyl alcohol	[66]
76	n-Octanal	[66]	119	Octadecyl-acetate	[66]
77	6-Methyl-5-hepten-2-one	[66]	120	Phenylethyl alcohol	[66]
78	n-Hexanol	[66]	121	Cuminyal acetate	[66]
79	n-Nonanal	[66]	122	Dodecanol	[66]
80	Ocimenone	[66]	123	Perilla alcohol	[66]
81	trans-2-Octenal	[66]	124	Cinnamaldehyde	[66]
82	β -Thujone	[66]	125	Benzene propanol	[66]
83	β p-Dimethyl styrene	[66]	126	1,4-p-Menthadien-7-ol	[66]
84	cis-Linalool oxide	[66]	127	Octanoic acid	[66]
85	Menthone	[66]	128	Cumin-alcohol	[66]
86	trans-Linalool oxide	[66]	129	Cinnamyl-acetate	[66]
87	Isomenthone	[66]	130	Thymol	[66]
88	n-Decanal	[66]	131	Carvacrol	[66]
89	Benzylaldehyde	[66]	132	Cinnamyl-alcohol	[58], [66]
90	Isopinocampone	[66]	133	Decanoic acid	[66]
91	trans-2-Nonenal	[66]	134	Dodecanoic acid	[66]
92	Pinocarvone	[66]	135	Acetovanillone	[66]
93	Linalool	[66]	136	Benzyl benzoate	[66]
94	n-Octanol	[66]	137	Tetradecanoic acid	[66]
95	Bornyl-acetate	[66]	138	Pentadecanoic acid	[66]
96	β -Caryophyllene	[66]	139	Hexadecanoic acid	[66]

3. APPENDIX – TABLE 3: CHEMICAL COMPOSITION OF *WITHANIA FRUDESCENS*

Table 3a: Constituents of *W. frutescens*: Withanolides

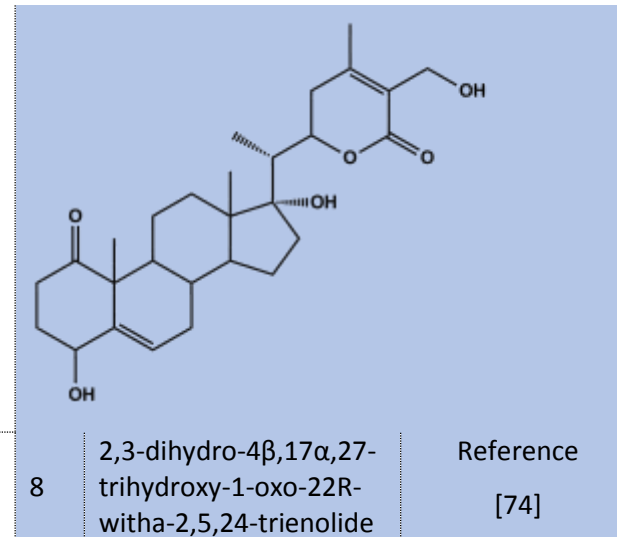
								
1	Withaferin A	Reference [74]	2	Dihydrowithaferin A	Reference [74]	3	2,3-dihydroxywithaferin A-3β-O-sulfate	Reference [70]
								
4	4β,27-dihydroxy-1-oxo-5β,6β-epoxy-22R-witha-2,14,24-trienolide	Reference [74], [75]	5	5β,6β-epoxy-4β,17α,27-trihydroxy-1-oxo-witha-2,24-dienolide	Reference [70]	6	4β,5β,27-trihydroxy-1-oxo-6α-chloro-22R-with a-2,24-dienolide	Reference [74]



7

4 β ,17 α ,27-trihydroxy-
1-oxo-22R-witha-
2,5,24-trienolide

Reference
[74]

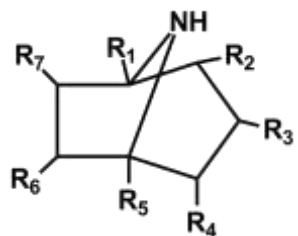


8

2,3-dihydro-4 β ,17 α ,27-
trihydroxy-1-oxo-22R-
witha-2,5,24-trienolide

Reference
[74]

Table 3b: Constituents of *W. frutescens*: Calystegines



	Name	R ₁	R ₂	R ₃	R ₄	R ₅	R ₆	R ₇	Reference
9	Calystegine A3	···· H	H	◀OH	···· OH	◀OH	H	H	[72]
10	Calystegine B1	···· H	H	◀OH	···· OH	◀OH	H	◀OH	[72]
11	Calystegine B2	···· H	···· OH	◀OH	···· OH	◀OH	H	H	[72]
12	Calystegine B3	···· H	◀OH	···· OH	···· OH	◀OH	H	H	[72]
13	Calystegine C1	···· OH	···· OH	◀OH	···· OH	◀H	···· OH	H	[72]
14	Calystegine N1	···· H	···· OH	◀OH	···· OH	◀NH ₂	H	H	[72]

Table 3c: Constituents of *W. frutescens*: Flavonoids

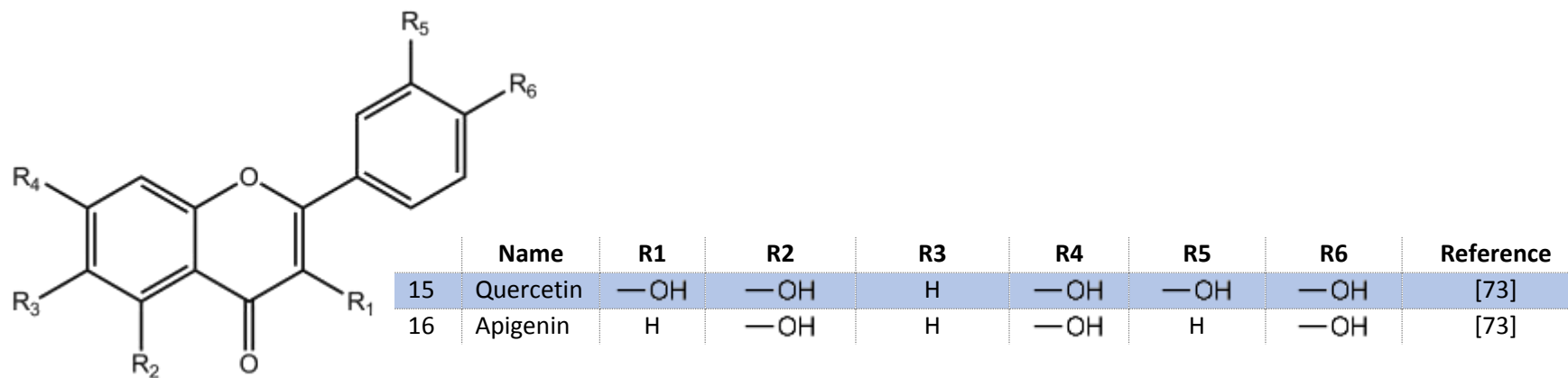


Table 3d: Constituents of *W. frutescens*: Phenolic acids

	Name	Reference
17	Caffeic acid	[73]
18	Ferulic acid	[73]
19	Gallic acid	[73]
20	p-coumaric acid	[73]
21	Tannic acid	[73]

4. APPENDIX: RHODIOLA ROSEA SAMPLES

Sample set A

No.:	Origin	Region	Approx. coordinates	Altitude (meter a.s.l.)	Region group
P01	Iceland	Skogar	63°25'N, 20°30' W	50	NW-EUR
P02	Shetland	Lerwick	60°30' N, 01°00' W	10	NW-EUR
P03	Spain	Aneto	42°39' N, 0°37' E	2600	ALP/PYR
P04	Russia	Altai	n.s.	n.s.	ALTAI
P05	Faroe	Eidi	61°53' N, 6°47' W	30	NW-EUR
P06	Austria	Niedere Tauern	47°15' N, 13°34' E	30	ALP/PYR
P07	Russia	n.s., (ssp, arctica)	n.s.	n.s.	NE-EUR
P08	Russia	n.s., (South Siberia)	n.s.	n.s.	ALTAI
P09	Russia	Murmansk	68°58' N, 33°01' E	20	NE-EUR
P10	Italy	Aosta	n.s.	n.s.	ALP/PYR
P11	France	Monte Viso	44°42' N, 07°03' E	2300-2400	ALP/PYR
P12	Russia	Altai	49°27' N, 88°02' E	2400-2500	ALTAI
P13	Slovenia	Triglav	46°22' N, 13°49' E	1700-2200	ALP/PYR
P14	Switzerland	Wallis	46°22' N, 08°17' E	1200-1700	ALP/PYR
P15	Faroe	Gjov	62°19' N, 6°56' W	40	NW-EUR
P16	Finland	Hamina	60°39' N; 27°05' E	20	NE-EUR
P17	Russia	Altai	49°45' N; 89°36' E	2800	ALTAI
P18	Russia	Altai	49°45' N; 89°36' E	2500	ALTAI
P19	Austria	Gesause	47°33' N, 14°37' O	1450-1650	wild ALP
P20	Austria	Radst, Tauern	47°08' N, 13°20' O	2100-2400	wild ALP

Sample set B

No.:	Origin	Region	Approx, coordinates	Altitude (meter a.s.l.)
R1	Switzerland	Ticino, Alps	46°28'N, 8°46' E	1500
R2	Iceland	Westurland, Westiceland	64° 52' N, 23° 40'W	50
R3	Shetland	Lerwick, Mainland	60° 30' N, 01° 00'W	20
R4	Spain	Benasque, Pyrenees	42°39'N, 0°37' E	2600
R5	Finland	Pello, NW-Finland	66°59'N, 24°10' E	150
R7	Faroe	Eidi	62° 18' N, 7° 05'W	30
R8	France	Lesponne, Pyrenees	42°55'N, 0°04' E	1800
R10	Austria	Obertauern, Alps	47° 15' N, 13° 34' E	1750

5. APPENDIX: SAMPLES FOR GIRK CHANNEL INHIBITORY ASSAY

Experimental name	Plant code	Plant part	Extraction solvent
ZZmet_1	<i>W. frutescens</i> A	leaf	HeOH – H ₂ O (1:1)
ZZmet_2	<i>W. frutescens</i> B	leaf	HeOH – H ₂ O (1:1)
ZZmet_3	<i>W. frutescens</i> C	leaf	HeOH – H ₂ O (1:1)
ZZmet_4	<i>W. frutescens</i> D	leaf	HeOH – H ₂ O (1:1)
ZZmet_5	<i>W. frutescens</i> E	leaf	HeOH – H ₂ O (1:1)
ZZmet_6	<i>W. frutescens</i> F	leaf	HeOH – H ₂ O (1:1)
ZZmet_7	<i>W. frutescens</i> L1	leaf	HeOH – H ₂ O (1:1)
ZZmet_8	<i>W. frutescens</i> L2A	leaf	HeOH – H ₂ O (1:1)
ZZmet_9	<i>W. frutescens</i> L3	leaf	HeOH – H ₂ O (1:1)
ZZmet_10	<i>W. frutescens</i> L5B	leaf	HeOH – H ₂ O (1:1)
ZZmet_11	<i>W. frutescens</i> L7A	leaf	HeOH – H ₂ O (1:1)
ZZmet_12	<i>W. frutescens</i> L9A	leaf	HeOH – H ₂ O (1:1)
ZZmet_13	<i>W. frutescens</i> L11B	leaf	HeOH – H ₂ O (1:1)
ZZmet_14	<i>W. frutescens</i> 2	leaf	HeOH – H ₂ O (1:1)
ZZmet_15	<i>W. frutescens</i> 7	leaf	HeOH – H ₂ O (1:1)
ZZmet_16	<i>W. frutescens</i> 12	leaf	HeOH – H ₂ O (1:1)
ZZmet_17	<i>W. frutescens</i> 16	leaf	HeOH – H ₂ O (1:1)
ZZmet_18	<i>W. frutescens</i> 31	leaf	HeOH – H ₂ O (1:1)
ZZmet_19	<i>W. frutescens</i> 35	leaf	HeOH – H ₂ O (1:1)
ZZmet_20	<i>W. frutescens</i> 40	leaf	HeOH – H ₂ O (1:1)
ZZmet_21	<i>W. frutescens</i> 45	leaf	HeOH – H ₂ O (1:1)
ZZmet_22	<i>W. frutescens</i> 63	leaf	HeOH – H ₂ O (1:1)
ZZmet_23	<i>W. frutescens</i> 74	leaf	HeOH – H ₂ O (1:1)
ZZmet_24	<i>W. frutescens</i> 81	leaf	HeOH – H ₂ O (1:1)
ZZmet_25	<i>W. frutescens</i> 82	leaf	HeOH – H ₂ O (1:1)
ZZmet_26	<i>W. frutescens</i> 85	leaf	HeOH – H ₂ O (1:1)
ZZmet_27	<i>W. frutescens</i> 86	leaf	HeOH – H ₂ O (1:1)
ZZmet_28	<i>W. frutescens</i> 89	leaf	HeOH – H ₂ O (1:1)
ZZmet_29	<i>W. frutescens</i> 93	leaf	HeOH – H ₂ O (1:1)
ZZmet_30	<i>W. frutescens</i> 108	leaf	HeOH – H ₂ O (1:1)
ZZmet_31	<i>W. frutescens</i> 110	leaf	HeOH – H ₂ O (1:1)
ZZmet_32	<i>W. frutescens</i> WF3	leaf	HeOH – H ₂ O (1:1)
ZZmet_33	<i>W. frutescens</i> WF3	leaf	CH ₂ Cl ₂
ZZmet_34	<i>W. frutescens</i> WF3	leaf	CH ₂ Cl ₂ – MeOH (1:1)
ZZmet_35	<i>W. frutescens</i> WF3	leaf	EtOH
ZZmet_36	<i>W. frutescens</i> WF3	leaf	EtOH – H ₂ O (1:1)
ZZmet_37	<i>W. frutescens</i> WF4B	leaf	HeOH – H ₂ O (1:1)
ZZmet_38	<i>W. frutescens</i> WF5A	leaf	HeOH – H ₂ O (1:1)
ZZmet_39	<i>W. frutescens</i> WF6A	leaf	HeOH – H ₂ O (1:1)
ZZmet_40	<i>W. frutescens</i> WF7B	leaf	HeOH – H ₂ O (1:1)
ZZmet_41	<i>W. frutescens</i> WF F-1-V	leaf	HeOH – H ₂ O (1:1)
ZZmet_42	<i>W. frutescens</i> WF M4VIII	leaf	HeOH – H ₂ O (1:1)

ZZmet_43	<i>W. frutescens</i> R	twigs	HeOH – H ₂ O (1:1)
ZZmet_44	<i>W. frutescens</i> T5A	twigs	HeOH – H ₂ O (1:1)
ZZmet_45	<i>W. frutescens</i> T10B	twigs	HeOH – H ₂ O (1:1)
ZZmet_46	<i>W. frutescens</i> (N)T12	twigs	HeOH – H ₂ O (1:1)
ZZmet_47	<i>W. frutescens</i> (N)T28	twigs	HeOH – H ₂ O (1:1)
ZZmet_48	<i>W. frutescens</i> M	roots	HeOH – H ₂ O (1:1)
ZZmet_49	<i>W. frutescens</i> R3	roots	HeOH – H ₂ O (1:1)
ZZmet_50	<i>W. frutescens</i> R6A	roots	HeOH – H ₂ O (1:1)
ZZmet_51	<i>W. frutescens</i> (N)R14	roots	HeOH – H ₂ O (1:1)
ZZmet_52	<i>W. frutescens</i> (N)R32	roots	HeOH – H ₂ O (1:1)
ZZmet_53	<i>W. frutescens</i> F4B	fruits	HeOH – H ₂ O (1:1)
ZZmet_54	<i>W. frutescens</i> F5A	fruits	HeOH – H ₂ O (1:1)
ZZmet_55	<i>W. frutescens</i> F7B	fruits	HeOH – H ₂ O (1:1)
ZZmet_A	R. rosea extract	roots	EtOH – H ₂ O (70:30)
ZZmet_B	<i>W. frutescens</i> M	roots	HeOH – H ₂ O (1:1)
ZZmet_C	<i>W. frutescens</i> (N)R14	roots	HeOH – H ₂ O (1:1)
ZZmet_D	sugar	-	
ZZmet_F	<i>W. frutescens</i> D	leaf	HeOH – H ₂ O (1:1)
ZZmet_G	<i>W. frutescens</i> WF3	leaf	HeOH – H ₂ O (1:1)
ZZmet_J	<i>W. frutescens</i> F7B	fruits	HeOH – H ₂ O (1:1)
ZZmet_K	<i>W. frutescens</i> T10B	twigs	HeOH – H ₂ O (1:1)
ZZmet_I	Withaferin A	isolate	

6. APPENDIX - FIGURE A1: ISOLATION CHART OF RHAPONTICUM CARTHAMOIDES

