applied sciences

MDPI

Supplementary Materials: Phytohormones and Elicitors Enhanced the Ecdysteroid and Glycosylflavone Content and Antioxidant Activity of *Silene repens*

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Table S1. Yields of SPE fractions of total extracts from *S. repens* leaves and roots.

Group	Concentration, mg/L	Yields, %*	
		SPE-1	SPE-2
Control 1 (water, spraying)	-	28.1	20.4
Control 2 (watering)	-	29.4	20.6
Epibrassinolide	1	27.3	16.8
	10	26.8	17.4
	100	25.8	18.1
Indole-3-butyric acid	1	27.6	17.5
	10	27.1	17.8
	100	28.3	18.6
4-Chlorophenylacetic acid	1	26.4	18.1
	10	25.9	18.9
	100	26.2	19.3
Gibberellic acids potassium salts	1	28.6	19.8
	10	28.9	20.1
	100	29.1	20.9
Arachidonic acid	1	27.7	17.5
	10	28.2	17.8
	100	28.4	18.1
Ethyl arachidonate	1	26.9	16.3
	10	27.3	17.1
	100	27.9	17.5

* of dry plant weight.

Table S2. Chromatographic (t_R), ultraviolet data (UV) and mass-spectrometric data (ESI-MS/MS) of compounds 1–18 found in *S. repens*.

No	t_R, min	Compound	UV, λ_{max}, nm	ESI-MS/MS, *m/z* [M+H]$^+$ / [M-H]$^-$	MS/MS Fragment Ions	Ref.
				Positive ionization		
1	3.98	26-Hydroxyintegristerone A	240	513	551 [M+K]$^+$, 535 [M+Na]$^+$, 517 [(M+Na)–H_2O]$^+$, 495 [(M+H)–H_2O]$^+$, 477 [(M+H)–2×H_2O]$^+$, 463 [(M+H)–CH_3OH–H_2O]$^+$, 459 [(M+H)–3×H_2O]$^+$, 441 [(M+H)–4×H_2O]$^+$, 407 [(M+H)–$C_4H_{10}O_3$]$^+$, 405 [(M+H)–$C_4H_{10}O_2$–H_2O]$^+$, 389 [(M+H)–$C_4H_{10}O_3$–H_2O]$^+$, 387 [(M+H)–$C_4H_{10}O_2$–2×H_2O]$^+$, 371 [(M+H)–$C_4H_{10}O_3$–2×H_2O]$^+$, 357 [(M+H)–CH_3OH–$C_4H_{10}O_3$–H_2O]$^+$, 317 [(M+H)–$C_8H_{18}O_4$–H_2O]$^+$, 299 [(M+H)–$C_8H_{18}O_4$–2×H_2O]$^+$, 211 [(M+H)–$C_8H_{18}O_4$–$C_4H_{10}O_3$–H_2O]$^+$, 160 [$C_8H_{18}O_4$–H_2O]$^+$.	[18,30]
2	4.19	20,26-Dihydroxyecdysone	240	497	535 [M+K]$^+$, 519 [M+Na]$^+$, 479 [(M+H)–H_2O]$^+$, 461 [(M+H)–2×H_2O]$^+$, 443 [(M+H)–3×H_2O]$^+$, 425 [(M+H)–4×H_2O]$^+$	[18,30]
3	4.52	26-Hydroxypolypodine B	240	513	551 [M+K]$^+$, 535 [M+Na]$^+$, 495 [(M+H)–H_2O]$^+$, 477 [(M+H)–2×H_2O]$^+$, 459 [(M+H)–3×H_2O]$^+$, 441 [(M+H)–4×H_2O]$^+$	[18,30]
4	4.87	Integristerone A	240	497	535 [M+K]$^+$, 519 [M+Na]$^+$, 479 [(M+H)–H_2O]$^+$, 461 [(M+H)–2×H_2O]$^+$, 443 [(M+H)–3×H_2O]$^+$, 425 [(M+H)–4×H_2O]$^+$, 423 [(M+H)–$C_4H_{10}O$]$^+$, 405 [(M+H)–$C_4H_{10}O$–H_2O]$^+$, 391 [(M+H)–$C_4H_{10}O_3$]$^+$, 387 [(M+H)–$C_4H_{10}O$–2×H_2O]$^+$, 373 [(M+H)–$C_4H_{10}O_3$–H_2O]$^+$, 355 [(M+H)–$C_4H_{10}O_3$–2×H_2O]$^+$, 335 [(M+H)–$C_8H_{18}O_3$]$^+$, 317 [(M+H)–$C_8H_{18}O_3$–H_2O]$^+$, 299 [(M+H)–$C_8H_{18}O_3$–2×H_2O]$^+$, 229 [(M+H)–$C_4H_{10}O_3$–$C_8H_{18}O_3$]$^+$, 211 [(M+H)–$C_4H_{10}O_3$–$C_8H_{18}O_3$–H_2O]$^+$, 144 [$C_8H_{18}O_3$–H_2O]$^+$	[29]
5	5.16	Turkesterone	240	497	535 [M+K]$^+$, 519 [M+Na]$^+$, 479 [(M+H)–H_2O]$^+$, 461 [(M+H)–2×H_2O]$^+$, 443 [(M+H)–3×H_2O]$^+$, 425 [(M+H)–4×H_2O]$^+$	[18,30]
6	6.09	20-Hydroxyecdysone	240	481	519 [M+K]$^+$, 503 [M+Na]$^+$, 463 [(M+H)–H_2O]$^+$, 445 [(M+H)–2×H_2O]$^+$, 427 [(M+H)–3×H_2O]$^+$, 409 [(M+H)–4×H_2O]$^+$, 407 [(M+H)–$C_4H_{10}O$]$^+$, 391 [(M+H)–$C_4H_{10}O_2$]$^+$, 389 [(M+H)–$C_4H_{10}O$–H_2O]$^+$, 373 [(M+H)–$C_4H_{10}O_2$–H_2O]$^+$, 371 [(M+H)–$C_4H_{10}O$–2×H_2O]$^+$, 355 [(M+H)–$C_4H_{10}O_2$–2×H_2O]$^+$, 319 [(M+H)–$C_8H_{18}O_3$]$^+$, 317 [(M+H)–$C_4H_{10}O_2$–$C_4H_{10}O$]$^+$, 301 [(M+H)–$C_8H_{18}O_3$–H_2O]$^+$, 299 [(M+H)–$C_4H_{10}O_2$–$C_4H_{10}O$–H_2O]$^+$, 283 [(M+H)–$C_8H_{18}O_3$–2×H_2O]$^+$, 229 [(M+H)–$C_4H_{10}O_2$–$C_8H_{18}O_3$]$^+$, 211 [(M+H)–$C_4H_{10}O_2$–$C_8H_{18}O_3$–H_2O]$^+$, 144 [$C_8H_{18}O_3$–H_2O]$^+$	[29]
7	6.22	Polypodine B	240	497	535 [M+K]$^+$, 519 [M+Na]$^+$, 479 [(M+H)–H_2O]$^+$, 461 [(M+H)–2×H_2O]$^+$, 443 [(M+H)–3×H_2O]$^+$, 425 [(M+H)–4×H_2O]$^+$, 423 [(M+H)–$C_4H_{10}O$]$^+$, 407 [(M+H)–$C_4H_{10}O_2$]$^+$, 405 [(M+H)–$C_4H_{10}O$–H_2O]$^+$, 389 [(M+H)–$C_4H_{10}O_2$–H_2O]$^+$, 387 [(M+H)–$C_4H_{10}O$–2×H_2O]$^+$, 371 [(M+H)–$C_4H_{10}O_2$–2×H_2O]$^+$, 335 [(M+H)–$C_8H_{18}O_3$]$^+$, 333 [(M+H)–$C_4H_{10}O_2$–$C_4H_{10}O$]$^+$, 317 [(M+H)–$C_8H_{18}O_3$–H_2O]$^+$, 315 [(M+H)–$C_4H_{10}O_2$–$C_4H_{10}O$–H_2O]$^+$, 299 [(M+H)–$C_8H_{18}O_3$–2×H_2O]$^+$, 245 [(M+H)–$C_4H_{10}O_2$–$C_8H_{18}O_3$]$^+$, 227 [(M+H)–$C_4H_{10}O_2$–$C_8H_{18}O_3$–H_2O]$^+$, 144 [$C_4H_{10}O$–H_2O]$^+$	[18,30]
8	6.39	26-Hydroxyecdysone	240	481	519 [M+K]$^+$, 503 [M+Na]$^+$, 463 [(M+H)–H_2O]$^+$, 445 [(M+H)–2×H_2O]$^+$, 427 [(M+H)–3×H_2O]$^+$, 409 [(M+H)–4×H_2O]$^+$, 347 [(M+H)–$C_6H_{14}O_3$]$^+$, 329 [(M+H)– $C_6H_{14}O_3$–H_2O]$^+$	[18,30]

9	7.13	Ecdysone	240	465	503 $[M+K]^+$, 487 $[M+Na]^+$, 447 $[(M+H)–H_2O]^+$, 429 $[(M+H)–2×H_2O]^+$, 411 $[(M+H)–3×H_2O]^+$, 391 $[(M+H)–C_4H_{10}O]^+$, 375 $[(M+H)–C_4H_{10}O_2]^+$, 373 $[(M+H)–C_4H_{10}O–H_2O]^+$, 357 $[(M+H)–C_4H_{10}O_2–H_2O]^+$, 355 $[(M+H)–C_4H_{10}O–2×H_2O]^+$, 339 $[(M+H)–C_4H_{10}O_2–2×H_2O]^+$, 319 $[(M+H)–C_8H_{18}O_2]^+$, 301 $[(M+H)–C_8H_{18}O_2–H_2O]^+$, 283 $[(M+H)–C_8H_{18}O_2–2×H_2O]^+$, 229 $[(M+H)–C_4H_{10}O_2–C_8H_{18}O_2]^+$, 211 $[(M+H)–C_4H_{10}O_2–C_8H_{18}O_2–H_2O]^+$, 128 $[C_4H_{10}O_3–H_2O]^+$	[18,30]
10	7.21	2-Deoxy-20-hydroxyecdysone	240	465	503 $[M+K]^+$, 487 $[M+Na]^+$, 447 $[(M+H)–H_2O]^+$, 429 $[(M+H)–2×H_2O]^+$, 411 $[(M+H)–3×H_2O]^+$, 391 $[(M+H)–C_4H_{10}O]^+$, 373 $[(M+H)–C_4H_{10}O–H_2O]^+$, 355 $[(M+H)–C_4H_{10}O–2×H_2O]^+$, 317 $[(M+H)–2×C_4H_{10}O]^+$, 303 $[(M+H)–C_8H_{18}O_3]^+$, 299 $[(M+H)–2×C_4H_{10}O–H_2O]^+$, 285 $[(M+H)–C_8H_{18}O_3–H_2O]^+$, 229 $[(M+H)–C_4H_{10}O–C_8H_{18}O_3]^+$, 211 $[(M+H)–C_4H_{10}O–C_8H_{18}O_3–H_2O]^+$, 144 $[C_8H_{18}O_3–H_2O]^+$	[29]
11	7.52	20-hydroxyecdysone 2-acetate	240	523	561 $[M+K]^+$, 545 $[M+Na]^+$, 481 $[(M+H)–C_2H_2O]^+$, 463 $[(M+H)–C_2H_2O–H_2O]^+$, 445 $[(M+H)–C_2H_2O–2×H_2O]^+$, 427 $[(M+H)–C_2H_2O–3×H_2O]^+$, 409 $[(M+H)–C_2H_2O–4×H_2O]^+$	[18,30]
12	8.27	Viticosterone E	240	523	561 $[M+K]^+$, 545 $[M+Na]^+$, 481 $[(M+H)–C_2H_2O]^+$, 463 $[(M+H)–C_2H_2O–H_2O]^+$, 445 $[(M+H)–C_2H_2O–2×H_2O]^+$, 427 $[(M+H)–C_2H_2O–3×H_2O]^+$, 409 $[(M+H)–C_2H_2O–4×H_2O]^+$	[18,30]
					Negative ionization	
13	5.42	Schaftoside-2″-*O*-glucoside (sileneside E)	270, 333	725	563 $[(M–H)–C_6H_{10}O_5]^-$, 473 $[(M–H)–C_6H_{10}O_5–60]^-$, 353 $[(M–H)–C_6H_{10}O_5–60–120]^-$, 325 $[(M–H)–C_6H_{10}O_5–60–120–CO]^-$, 297 $[(M–H)–C_6H_{10}O_5–60–120–2×CO]^-$	[18,30]
14	6.18	Schaftoside	270, 334	563	503 $[(M–H)–60]^-$, 473 $[(M–H)–90]^-$, 443 $[(M–H)–120]^-$, 413 $[(M–H)–60–90]^-$, 385 $[(M–H)–60–90–CO]^-$, 383 $[(M–H)–60–120]^-$ or $[(M–H)–2×90]^-$, 355 $[(M–H)–60–120–CO]^-$ or $[(M–H)–2×90–CO]^-$, 353 $[(M–H)–90–120]^-$, 325 $[(M–H)–90–120–CO]^-$	[31]
15	6.45	Isovitexin-2″-*O*-glucoside (meloside A)	270, 335	593	473 $[(M–H)–120]^-$, 431 $[(M–H)–Glc]^-$, 341 $[(M–H)–Glc–90]^-$, 311 $[(M–H)–Glc–120]^-$, 313 $[(M–H)–Glc–90–CO]^-$, 283 $[(M–H)–Glc–120–CO]^-$	[18,30]
16	6.52	Isovitexin	270, 336	431	341 $[(M–H)–90]^-$, 311 $[(M–H)–120]^-$, 313 $[(M–H)–90–CO]^-$, 283 $[(M–H)–120–CO]^-$	[31]
17	7.17	Swertisin-2″-*O*-glucoside	270, 338	607	445 $[(M–H)–C_6H_{10}O_5]^-$, 355 $[(M–H)–C_6H_{10}O_5–90]^-$, 325 $[(M–H)–C_6H_{10}O_5–120]^-$, 327 $[(M–H)–C_6H_{10}O_5–90–CO]^-$, 297 $[(M–H)–C_6H_{10}O_5–120–CO]^-$	[31]
18	7.28	Swertisin	270, 339	445	355 $[(M–H)–90]^-$, 325 $[(M–H)–120]^-$, 327 $[(M–H)–90–CO]^-$, 297 $[(M–H)–120–CO]^-$	[31]

Table S3. Regression equations, correlation coefficients (r^2), standard deviation (S_{YX}), limits of detection (LOD), limits of quantification (LOQ) and linear ranges for 5 reference standards.

Compound	Ionization[a]	CE[b] (eV)	Regression equation[c]		r^2	S_{YX}	LOD/ LOQ (μg/mL)	Linear range (μg/mL)
			a	*b*·10⁶				
20-Hydroxyecdysone	P	+20	1.6705	-0.4374	0.9988	$12.79 \cdot 10^{-2}$	0.25/0.77	0.8–100.0
Polypodine B	P	+20	1.2410	-0.4032	0.9973	$11.09 \cdot 10^{-2}$	0.30/0.91	1.0–100.0
Isovitexin	N	+35	0.054	-0.028	0.9739	$5.09 \cdot 10^{-3}$	0.31/0.94	1.00–900.0
Schaftoside	N	+35	5.2511	-0.1273	0.9895	9.26·10-2	0.05/0.17	0.2–100.0
Swertisin	N	+20	3.8206	-0.6731	0.9904	8.59·10-2	0.07/0.22	0.3–100.0