Allelopatic Activity of Canadian Goldenrod (*Solidago canadensis* L.) Extracts on Seed Germination and Growth of Lettuce (*Lactuca sativa* L.) and Garden Pepper Cress (*Lepidium sativum* L.)

Asta Judžentienė, Jurga Būdienė, Linas Labanauskas, Donata Stancelytė and Irena Nedveckytė

Table S1. Minor constituents (< 3.0%) identified in inflorescence, leaf and root EOs of *S. canadensis*

Minor compounds found in the EOs of *S. canadensis* overground parts (inflorescences and leaves)
tricyclene, α-thujene, α-myrcene, α-phellandrene, α-, γ-terpinene, *p*-cymene, (*Z*),(*E*)-β-ocimene, *cis*-, *trans*-sabinene hydrate, *trans*-linalool oxide, terpinolene, linalool*, α-campholenal, 6-camphenone, perillene, sabina ketone, *cis*-, *trans*-limonene oxide, pinocarvone, terpinen-4-ol, *p*-cymen-8-ol, α-terpineol, myrtenol, myrtenal, carvone, myrtenyl acetate, perilla aldehyde, perilla alcohol, δ-elemene, α-cubebene, eugenol, α-, β-ylangene, α-, β-copaene, β-bourbonene, β-caryophyllene*, (*E*)-β-farnesene, α-humulene*, *cis*-cadina-1(6), 4-diene, *cis*-muurola-4(14), 5-diene, bicyclogermacrene, α-muurolene, β-bisabolene, β-sesquiphellandrene, α-, γ-, δ-cadinene, α-, β-calacorene, germacrene B, nerolidol, spathulenol, caryophyllene oxide*, salvia-4(14)-en-1-one, *cis*-cadin-4-en-7-ol, *ar*-tumerone, α-, τ-muurolol, α-cadinol, 1,3-dihydrofarnesol, 15-oxy-α-muurolene, phytone, farnesyl acetone, n-hexadecanoic acid, (*E*,*E*)-geranyl linalool and phytol.
Minor constituents determined in the EO of *S. canadensis* hairy roots
tricyclene, α-thujene, α-myrcene, camphene, sabinene, α-phellandrene, α-, γ-terpinene, *p*-cymene, *cis*-, *trans*-sabinene hydrate, terpinolene, *p*-cymenene, fenchyl alcohol, *cis*-, *trans*-limonene oxide, pinocarvone, terpinen-4-ol, myrtanal, *p*-cymen-8-ol, α-terpineol, myrtenol, myrtenal, thymol methyl ether, carvone, methyl camphonoate, perilla alcohol, carvacrol, (*E*,*E*)-2,4-decadienal, δ-elemene, α-terpinyl acetate, α-, β-copaene, (*Z*)-jasmone, α-bergamotene, β-caryophyllene*, (*E*)-β-farnesene, α-humulene*, α-, γ-curcumene, β-selinene, α-zingiberene, α-selinene, β-sesquiphellandrene, humulene epoxide II, intermedeol, phytone and n-hexadecanol.

* Additional identification with reference compound.

Table S2. The effect of root aqueous extracts of *S. canadensis*, *S. virgaurea* and *S.* × *niederederi* on germination rate (GR), relative germination (RG) and vigor index (VI) of lettuce (*Lactuca sativa* L.) and garden pepper cress (*Lepidium sativum* L.) seeds.

	AQUEOUS EXTRACTS FROM ROOTS					
Treatments	**Germination rate, %**					
	S. canadensis		*S. virgaurea*		*S.* × *niederederi*	
	Lettuce	Cress	Lettuce	Cress	Lettuce	Cress
Control	96.7	95.00	93.33	96.66	95.00	93.33
0.1	90.00	96.66	95.00	91.66	96.66	83.33
0.5	91.66	76.66	50.00*	63.33*	85.00	76.66
1.0	88.33	70.00*	0.00*	8.33*	81.66	0.00*
Treatments	**Relative germination, %**					
	S. canadensis		*S. virgaurea*		*S.* × *niederederi*	
	Lettuce	Cress	Lettuce	Cress	Lettuce	Cress
Control	100.00	100.00	100.00	100.00	100.00	100.00
0.1	93.07	101.75	101.79	94.83	101.75	89.29
0.5	94.79	80.69	53.57*	65.52*	89.47	82.14
1.0	91.34	73.68*	0.00*	8.62*	85.96	0.00*
Treatments	**Vigor index**					
	S. canadensis		*S. virgaurea*		*S.* × *niederederi*	
	Lettuce	Cress	Lettuce	Cress	Lettuce	Cress
Control	3613.36	4303.5	4101.85	4734.73	4107.17	4703.83
0.1	2973.00	3576.42	3747.75	6234.41	3201.06	3501.25
0.5	4700.63	2922.02	390.83	2829.79	2657.67	3746.12
1.0	4943.53	3371.67	0.00	11.11	2497.43	0.00

Asterisk (*) indicates a statistically significant difference compared to the control (G-test, $p<0.05$).

Table S3. The effect of leaf aqueous extracts of *S. canadensis*, *S. virgaurea* and *S. × niederederi* on germination rate (GR), relative germination (RG) and vigor index (VI) of lettuce and garden pepper cress seeds.

AQUEOUS EXTRACTS FROM LEAVES						
Treatments	**Germination rate, %**					
	S. canadensis		*S. virgaurea*		*S. × niederederi*	
	Lettuce	Cress	Lettuce	Cress	Lettuce	Cress
Control	95.00	91.67	95.00	93.33	93.33	93.33
0.1	86.67	86.67	88.33	98.33	93.33	86.67
0.5	78.33	85.00	91.67	91.67	88.33	63.33*
1.0	80.00	70.00	86.67	96.67	85.00	68.33*
Treatments	**Relative germination, %**					
	S. canadensis		*S. virgaurea*		*S. × niederederi*	
	Lettuce	Cress	Lettuce	Cress	Lettuce	Cress
Control	100.00	100.00	100.00	100.00	100.00	100.00
0.1	91.23	94.55	92.98	105.36	100.00	92.86
0.5	82.45	92.72	96.49	98.22	94.64	67.86*
1.0	84.21	76.36	91.23	103.58	91.07	73.21*
Treatments	**Vigor index**					
	S. canadensis		*S. virgaurea*		*S. × niederederi*	
	Lettuce	Cress	Lettuce	Cress	Lettuce	Cress
Control	3560.92	6566.63	4056.5	5590.47	4342.96	5646.46
0.1	2049.75	4659.96	3587.67	4131.5	3008.34	4729.29
0.5	852.49	1358.58	3012.89	1643.95	2203.83	815.9
1.0	548.00	165.67	1451.72	159.5	1137.58	86.55

Asterisk (*) indicates a statistically significant difference compared to the control (G-test, $p<0.05$).

Table S4. The effect of inflorescence aqueous extracts of *S. canadensis*, *S. virgaurea* and *S. × niederederi* on germination rate (GR), relative germination (RG) and vigor index (VI) of lettuce and garden pepper cress seeds.

AQUEOUS EXTRACTS FROM INFLORESCENCES						
Treatments	**Germination rate, %**					
	S. canadensis		*S. virgaurea*		*S. × niederederi*	
	Lettuce	Cress	Lettuce	Cress	Lettuce	Cress
Control	86.67	95.00	95.00	93.33	93.33	95.00
0.1	83.33	88.33	86.67	81.67	95.00	88.33
0.5	85.00	58.33*	86.67	71.67	86.67	0.00*
1.0	60.00*	51.67*	71.67	50.00*	83.33	0.00*
Treatments	**Relative germination, %**					
	S. canadensis		*S. virgaurea*		*S. × niederederi*	
	Lettuce	Cress	Lettuce	Cress	Lettuce	Cress
Control	100.00	100.00	100.00	100.00	100.00	100.00
0.1	96.15	92.98	91.23	87.51	101.79	92.98
0.5	98.07	61.40*	91.23	76.79	92.86	0.00*
1.0	69.23*	54.39*	75.44	53.57*	89.28	0.00*
Treatments	**Vigor index**					
	S. canadensis		*S. virgaurea*		*S. × niederederi*	
	Lettuce	Cress	Lettuce	Cress	Lettuce	Cress
Control	3475.47	6574.00	3477.00	5654.24	3386.32	6194.5
0.1	1831.87	2271.55	2444.09	3456.00	3272.75	5198.22
0.5	640.33	42.77	2088.75	93.17	1310.16	0.00
1.0	126.00	27.56	265.18	30.00	552.76	0.00

Asterisk (*) indicates a statistically significant difference compared to the control (G-test, $p<0.05$).

Figure S1. Sampling site of plant material of *Solidago* species (*S. canadensis, S. virgaurea* and *S.* × *niederederi*) in Eastern Lithuania (Vilnius, Trakai municipality, Letvaris).

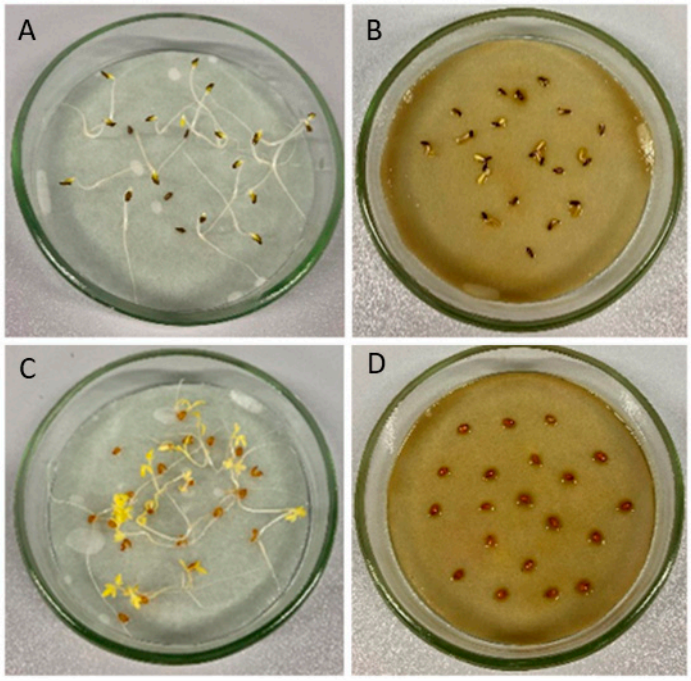

Figure S2. Control samples of *Lactuca sativa* L. seeds (A) and *L. sativa* seeds after treatment of aqueous *S. canadensis* root extract (B). Control samples of *Lepidium sativum* L. seeds (C) and *L. sativum* seeds after treatment of aqueous *S. canadensis* root extract (D).