

Short-term phytotoxicity in *Brassica napus* (L.) in response to pre-emergently applied metazachlor: A microcosm study

Supplementary material

VERCAMPT, Hanne; Koleva, Lyubka; Vassilev, Andon; VANGRONSVELD, Jaco & CUYPERS, Ann (2017) Short-term phytotoxicity in *Brassica napus* (L.) in response to pre-emergently applied metazachlor: A microcosm study. In: ENVIRONMENTAL TOXICOLOGY AND CHEMISTRY, 36(1), p. 59-70.

DOI: 10.1002/etc.3538

Handle: <http://hdl.handle.net/1942/23281>

Tables

Table 1. Parameters concerning growth, membrane damage, pigment and nutrient profile, antioxidative defence and detoxification in *B. napus* leaves, 14 DAT with 0 mM, 0.2 mM and 0.4 mM metazachlor. Data are shown as average values of minimal 4 biological replicates \pm SE. (post-hoc values: $p < 0.05$ are accentuated in grey).

Response level	Unit	14 Days after metazachlor treatment		
		0 mM	Metazachlor treatment 0.2 mM	0.4 mM
Growth				
Shoot weight	mg	599 \pm 31	338 \pm 19	209 \pm 15
Root weight	mg	119 \pm 9	52 \pm 4	28 \pm 2
Shoot length	cm	4.4 \pm 0.3	2.4 \pm 0.1	1.7 \pm 0.2
Root length	cm	12.0 \pm 0.5	6.0 \pm 0.5	3.1 \pm 0.3
Antioxidant defence and detoxification				
Total antioxidative capacity	μ mol Trolox eq./gFW	18 \pm 2	23 \pm 1	23 \pm 2
Hydrophilic fraction AO	μ mol Trolox eq./gFW	15 \pm 2	20 \pm 1	20 \pm 1
Lipophilic fraction AO	μ mol Trolox eq./gFW	2.8 \pm 0.3	3.3 \pm 0.3	3.9 \pm 0.8
Antioxidative enzymes				
SOD	mU/g FW	293 \pm 32	379 \pm 45	370 \pm 73
CAT	mU/g FW	7.5 \pm 1.4	13.5 \pm 1.8	9.4 \pm 1.4
APx	U/g FW	38 \pm 3.4	54 \pm 0.9	52 \pm 9.8
GR	mU/g FW	470 \pm 48	671 \pm 97	863 \pm 140
SPx	mU/g FW	39 \pm 6	178 \pm 74	241 \pm 38
GPx	mU/g FW	47 \pm 3.4	127 \pm 37	109 \pm 36
Antioxidative metabolites				
Total ascorbate	μ mol/gFW	4.3 \pm 0.7	4.3 \pm 0.5	5.7 \pm 0.6
Oxidised ascorbate	DHA/ASA ratio	0.19 \pm 0.04	0.13 \pm 0.02	0.13 \pm 0.04
Glutathione	nmol/gFW	515 \pm 57	428 \pm 32	465 \pm 66
Oxidised glutathione	GSSG/GSH ratio	0.034 \pm 0.006	0.049 \pm 0.012	0.069 \pm 0.008
Detoxifying enzymes				
GST-CDNB	mU/g FW	102 \pm 3	178 \pm 41	235 \pm 32
GST-Fluorodifen	mU/g FW	4.1 \pm 0.5	5.9 \pm 1.1	6.2 \pm 1.1
GST-Npa	mU/g FW	21 \pm 2	34 \pm 1	35 \pm 6
Membrane damage				
TBA reactive molecules	nmol/gFW	30 \pm 3	33 \pm 2	37 \pm 4
Potassium leakage	% extracellular K	5.8 \pm 0.3	7.7 \pm 1.4	5.1 \pm 1.4
Pigment and nutrient profile				
Pigment profile				
Chlorophyll <i>a</i>	mg/gFW	1.1 \pm 0.2	1.4 \pm 0.1	1.5 \pm 0.1
Chlorophyll <i>b</i>	mg/gFW	0.63 \pm 0.08	0.82 \pm 0.06	0.81 \pm 0.06
Chl <i>a/b</i>		1.9 \pm 0.02	1.7 \pm 0.1	1.8 \pm 0.2
Total Chlorophyll	mg/gFW	1.8 \pm 0.2	2.2 \pm 0.1	2.3 \pm 0.2
Carotenoids	mg/gFW	0.16 \pm 0.01	0.16 \pm 0.02	0.23 \pm 0.04
Chl / Car		11 \pm 1	15 \pm 3	11 \pm 2
Nutrient content				
Macronutrients				
K	(mg/gDW)	30 \pm 1	31 \pm 0.4	39 \pm 1
Ca	(mg/gDW)	20 \pm 1	21.2 \pm 0.3	26 \pm 1
P	(mg/gDW)	12 \pm 0.3	13 \pm 0.5	15 \pm 0.3
S	(mg/gDW)	11 \pm 0.3	12 \pm 0.2	12 \pm 1
Mg	(mg/gDW)	3.7 \pm 0.2	3.9 \pm 0.1	4.4 \pm 0.2
Micronutrients				
Na	(mg/gDW)	1.2 \pm 0.1	1.3 \pm 0.1	1.0 \pm 0.04
Fe	(μ g/gDW)	438 \pm 104	489 \pm 275	171 \pm 19
Mn	(μ g/gDW)	76 \pm 3	82 \pm 1	137 \pm 7
Zn	(μ g/gDW)	29 \pm 5	29 \pm 3	41 \pm 2
Cu	(μ g/gDW)	4.2 \pm 0.4	4.4 \pm 0.1	7.2 \pm 0.3

Table 2. Parameters concerning growth, membrane damage, pigment and nutrient profile, antioxidative defence and detoxification in *B. napus* leaves, 28 DAT with 0 mM, 0.2 mM and 0.4 mM metazachlor. Data are shown as average values of minimal 4 biological replicates \pm SE. (post-hoc values: $p < 0.05$ are accentuated in grey).

Response level	Unit	28 Days after metazachlor treatment		
		0 mM	0.2 mM	0.4 mM
Growth				
Shoot weight	g	9.7 \pm 0.8	5.5 \pm 1.1	2.6 \pm 0.6
Root weight	g	2.8 \pm 0.6	0.9 \pm 0.3	0.2 \pm 0.1
Shoot length	cm	4.7 \pm 0.6	2.5 \pm 0.2	1.6 \pm 0.1
Root length	cm	29 \pm 2	19 \pm 1	12 \pm 1
Antioxidant defence and detoxification				
Total antioxidative capacity	μ mol Trolox eq./gFW	24 \pm 1	27 \pm 2	28 \pm 1
Hydrophilic fraction AO	μ mol Trolox eq./gFW	18 \pm 1	18 \pm 2	18 \pm 1
Lipophilic fraction AO	μ mol Trolox eq./gFW	5.7 \pm 0.7	9.1 \pm 0.9	10 \pm 0.4
Antioxidative enzymes				
SOD	mU/g FW	261 \pm 18	305 \pm 13	441 \pm 32
CAT	mU/g FW	13 \pm 3	27 \pm 1	37 \pm 6
APx	U/g FW	8.4 \pm 2	12 \pm 1	14 \pm 3
GR	mU/g FW	394 \pm 6	516 \pm 40	644 \pm 63
SPx	mU/g FW	108 \pm 35	177 \pm 24	169 \pm 15
GPx	mU/g FW	35 \pm 15	43 \pm 6	112 \pm 25
Antioxidative metabolites				
Total ascorbate	μ mol/gFW	0.88 \pm 0.20	0.95 \pm 0.17	0.95 \pm 0.15
Oxidised ascorbate	DHA/ASA ratio	0.15 \pm 0.07	0.61 \pm 0.18	0.50 \pm 0.18
Glutathione	nmol/gFW	276 \pm 148	151 \pm 15	148 \pm 14
Oxidised glutathione	GSSG/GSH ratio	0.028 \pm 0.014	0.027 \pm 0.010	0.035 \pm 0.013
Detoxifying enzymes				
GST-CDNB	mU/g FW	69 \pm 19	116 \pm 11	148 \pm 19
GST-Fluorodifen	mU/g FW	3.0 \pm 0.6	5.0 \pm 0.8	7.2 \pm 1.4
GST-Npa	mU/g FW	22 \pm 1.0	28 \pm 2	34 \pm 2
Membrane damage				
TBA reactive molecules	nmol/gFW	23 \pm 2	32 \pm 2	33 \pm 3
Potassium leakage	% extracellular K	8.4 \pm 1.6	5.6 \pm 1.4	14 \pm 2
Pigment and nutrient profile				
Pigment profile				
Chlorophyll <i>a</i>	mg/gFW	0.81 \pm 0.02	0.95 \pm 0.05	0.89 \pm 0.03
Chlorophyll <i>b</i>	mg/gFW	0.24 \pm 0.003	0.27 \pm 0.01	0.27 \pm 0.01
Chl <i>a/b</i>		3.5 \pm 0.1	3.6 \pm 0.1	3.3 \pm 0.1
Total Chlorophyll	mg/gFW	1.05 \pm 0.06	1.22 \pm 0.06	1.15 \pm 0.03
Carotenoids	mg/gFW	0.145 \pm 0.004	0.164 \pm 0.008	0.162 \pm 0.004
Chl / Car		7.2 \pm 0.1	7.4 \pm 0.2	7.1 \pm 0.4
Nutrient content				
Macronutrients				
K	(mg/gDW)	56 \pm 5	47 \pm 2	45 \pm 1
Ca	(mg/gDW)	26 \pm 2	30 \pm 2	30 \pm 2
P	(mg/gDW)	7.3 \pm 0.2	4.6 \pm 1.5	6.1 \pm 0.3
S	(mg/gDW)	14 \pm 1	15 \pm 1	14 \pm 1
Mg	(mg/gDW)	5.5 \pm 0.2	7.0 \pm 0.2	7.1 \pm 0.3
Micronutrients				
Na	(mg/gDW)	1.4 \pm 0.1	2.7 \pm 0.1	2.3 \pm 0.2
Fe	(μ g/gDW)	204 \pm 25	295 \pm 62	230 \pm 58
Mn	(μ g/gDW)	101 \pm 18	155 \pm 10	114 \pm 30
Zn	(μ g/gDW)	39 \pm 5	60 \pm 3	16 \pm 5
Cu	(μ g/gDW)	4.3 \pm 0.5	4.3 \pm 0.1	3.5 \pm 0.2