

# Control of cabbage stem weevil and pollen beetle with one insecticide application

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## Electronic supplementary material (ESM)

Table S1. The spraying dates (timings I, II, III) and some crop and insect pest (*C. pallidactylus*, *C. napi* and *B. aeneus*) characteristics related to the dates (2016–2018)

Assessed characteristic	2016	2017	2018
Date of first spray, timing I (growth stage)	1.4. (BBCH 31 – 50; height 12 cm)	31.3. (BBCH 31; height 10 cm)	12.4. (BBCH 50; height 10 cm)
Date of first spray, timing II (growth stage)	8.4. (BBCH 53; height 40 cm)	10.4. (BBCH 53 – 55; height 45 cm)	19.4. (BBCH 51–53; height 15 cm)
Date of second spray, timing III (growth stage)	22.4. (BBCH 55; height 95 cm)	3.5. (BBCH 57 – 59; height 100 cm)	26.4. (BBCH 53–55; height 45 cm)
First record of $\geq 9$ adults of <i>C. pallidactylus</i> /yellow trap within 3 days <sup>1</sup>	23.3.	28.3.	3.4.
First record of $\geq 9$ adults of <i>C. napi</i> /yellow trap within 3 days <sup>1</sup>	threshold was not achieved in the season	threshold was not achieved in the season	6.4.

Assessed characteristic	2016	2017	2018
First record of $\geq 3$ adults of <i>B. aeneus</i> /main raceme in control plots (tr. 1 and tr. 10)	12.4.	beginning of May	threshold was not achieved in the season
First record of $\geq 3$ adults of <i>B. aeneus</i> /main raceme in plots sprayed at timing II with pyrethroids (tr. 3 and tr. 7) <sup>2</sup>	20.4.	beginning of May	threshold was not achieved in the season
Proportion of <i>C. pallidactylus</i> ( <i>C. napi</i> ) females with ripe eggs in ovaries in yellow water traps at the date of first spring spraying, timing I (%)	7.69 (33.33) <sup>3</sup>	26.00 (100) <sup>4</sup>	26.67 (42.86)
Proportion of <i>C. pallidactylus</i> ( <i>C. napi</i> ) females with ripe eggs in ovaries in yellow water traps at the date of first spring spraying, timing II (%)	50.45 (100)	86.73 (100)	73.91 (100)
Proportion of <i>C. pallidactylus</i> ( <i>C. napi</i> ) females with ripe eggs in ovaries in yellow water traps at the date of the second spring spraying, timing III (%)	71.35 (already not present in traps)	100 (100)	86.49 (100)

<sup>1</sup>common European threshold (also used in the Czech Republic) of  $\geq 9$  adult individuals of *C. pallidactylus* (*C. napi*)/yellow trap within 3 days; <sup>2</sup>according to results of this monitoring, the dates for the second spring applications (timing III) were determined; <sup>3</sup>one in three *C. napi* females recorded in the traps before the date of spraying had ripe eggs in the ovaries; <sup>4</sup> only one *C. napi* female recorded in traps before the date of spraying

Table S2. The results of monitoring the *C. pallidactylus*, *C. napi* and *B. aeneus* flight activity and the lengths of their egg-laying periods at the trial locality in seasons 2016–2018

Assessed insect pest	Assessed characteristic	2016	2017	2018
<i>C. pallidactylus</i>	total length of flight activity	14.3.–1.6.	16.3.–11.6.	29.3.–30.5.
	max. flight activity of males in season (date; average number of adults per trap within 3 days)	8.4.; 35.67	3.4.; 45.33	6.4.; 116.33
	max. flight activity of females in season (date; average number of adults per trap within 3 days)	8.4.; 9.00	3.4.; 12.33	25.4.; 11.67
	total length of egg-laying period	1.4.–10.5.	28.3.–5.6.	9.4.–30.5.
	the date of first record of flight activity – the date when on average 50% of females in traps had ripe eggs in ovaries; the length of the period in days	14.3.–8.4.; 25 days	16.3.–5.4.; 20 days	29.3.–15.4.; 17 days
	brief characterisation of flight activity	high, long, dangerous for crop	high, very long, dangerous for crop	high, very long, dangerous for crop
<i>C. napi</i>	total length of flight activity	17.3.–14.4.	2.3.–26.5.	29.3.–25.4.
	max. flight activity of males in season (date; average number of adults per trap within 3 days)	8.4.; 0.67	3.4.; 1.67	6.4.; 4.33
	max. flight activity of females in season (date; average number of adults per trap within 3 days)	8.4.; 1.33	3.4.; 2.00	6.4.; 5.00
	total length of egg-laying period	1.4.–14.4.	28.3.–22.5.	9.4.–25.4.
	the date of first record of flight activity - the date when on average 50% of females in traps had ripe eggs in ovaries; the length of the period in days	17.3.–4.4.; 18 days <sup>1</sup>	2.3.-probably substantially before 31.3. <sup>1</sup>	29.3.–15.4.; 17 days
	brief characterisation of flight activity	low, not dangerous for crop	low, long, not dangerous for crop	relatively high, dangerous for crop

Assessed insect pest	Assessed characteristic	2016	2017	2018
	total length of flight activity	30.3.–16.6.	30.3.-the end of monitoring <sup>2</sup>	30.3.-the end of monitoring <sup>2</sup>
<i>B. aeneus</i>	max. flight activity in the season (date; average number of adults per trap within 3 days)	15.4.; 299.45	15.5.; 258.46	18.5.; 21.33
	brief characterisation of flight activity	high during the second part of April, dangerous for crop	very low in the course of April; substantially increased during May,	low in the course of season, not dangerous for crop

<sup>1</sup>very low numbers of females for more precise determination; <sup>2</sup>the traps were emptied twice a week up till the end of June, flight activity of *B. aeneus* could still continue in July

Table S3. The differences in the mean levels of stem damage (damage caused by weevil larvae: mainly by *C. pallidactylus* and partly by *C. napi*) and in the levels of effectiveness recorded in the trials in 2016– 2018

Damage of stems induced by <i>C. pallidactylus</i> and <i>C. napi</i> larvae															
Tr.	2016					2017					2018				
	mean length of stem damage (cm) <sup>1</sup>	SD	95% CL (cm)	E (%) <sup>2</sup>	contribution of the second spray (%) <sup>3</sup>	mean length of stem damage (cm)	SD	95% CL (cm)	E (%) <sup>2</sup>	contribution of the second spray (%) <sup>3</sup>	mean length of stem damage (cm)	SD	95% CL (cm)	E (%) <sup>2</sup>	contribution of the second spray (%) <sup>3</sup>
1	30.97 <sup>a</sup>	14.69	27.70–34.24	0.00	× × ×	21.70 <sup>a</sup>	13.50	18.70–24.70	0.00	× × ×	30.83 <sup>ab</sup>	14.15	27.18–34.49	0.00	× × ×
2	12.97 <sup>c</sup>	11.61	10.38–15.55	58.12	0.00	11.24 <sup>bc</sup>	11.68	8.64–13.84	48.20	0.00	25.22 <sup>bc</sup>	13.59	21.71–27.73	18.20	0.00
3	18.96 <sup>b</sup>	10.63	16.60–21.33	38.78	0.00	16.39 <sup>ab</sup>	16.49	12.72–20.06	24.47	0.00	31.03 <sup>ab</sup>	14.63	27.25–34.81	"–0.65	0.00

Damage of stems induced by *C. pallidactylus* and *C. napi* larvae

Tr.	2016					2017					2018				
	mean length of stem damage (cm) <sup>1</sup>	SD	95% CL (cm)	E (%) <sup>2</sup>	contribution of second spray (%) <sup>3</sup>	mean length of stem damage (cm)	SD	95% CL (cm)	E (%) <sup>2</sup>	contribution of the second spray (%) <sup>3</sup>	mean length of stem damage (cm)	SD	95% CL (cm)	E (%) <sup>2</sup>	contribution of the second spray (%) <sup>3</sup>
4	14.29 <sup>bc</sup>	11.57	11.71–16.86	53.86	0.00	13.31 <sup>bc</sup>	14.55	10.08–16.55	38.66	0.00	29.49 <sup>abc</sup>	14.60	25.72–33.26	4.35	0.00
5	12.70 <sup>c</sup>	9.79	10.52–14.88	58.99	0.00	11.88 <sup>bc</sup>	12.66	9.06–14.69	45.25	0.00	20.13 <sup>de</sup>	13.65	16.61–23.66	34.71	0.00
6	13.27 <sup>c</sup>	8.87	11.30–15.25	57.15	"–2.31	11.25 <sup>bc</sup>	11.98	8.59–13.92	48.16	"–0.09	26.20 <sup>abcd</sup>	11.67	23.19–29.22	15.02	"–3.89
7	17.09 <sup>bc</sup>	14.65	13.83–20.35	44.82	9.86	10.23 <sup>bc</sup>	11.54	7.66–12.79	52.86	37.58	23.15 <sup>cde</sup>	13.84	19.57–26.73	24.91	25.40
8	14.45 <sup>bc</sup>	13.04	11.55–17.36	53.34	"–1.12	12.19 <sup>bc</sup>	11.92	9.54–14.84	43.83	8.42	31.35 <sup>ab</sup>	15.48	27.35–35.35	"–1.69	"–6.31
9	7.04 <sup>d</sup>	7.98	5.26–8.81	77.27	44.57	9.65 <sup>c</sup>	13.79	6.58–12.72	55.53	18.77	17.05 <sup>e</sup>	14.92	13.20–20.90	44.70	15.30
10	28.58 <sup>a</sup>	16.02	25.01–32.14	7.72	× × ×	21.40 <sup>a</sup>	15.64	17.92–24.88	1.38	× × ×	32.53 <sup>a</sup>	14.89	28.68–36.37	"–5.51	× × ×
S.A.	$F = 29.769; P < 0.001$					$F = 8.6318; P < 0.001$					$F = 8.3085; P < 0.001$				

Tr. – treatment; S.A. – statistical analysis; <sup>1</sup>the mean values placed in the same column – significantly different when they are marked with different letters; <sup>2</sup>effectiveness expressed according to Abbott's formula, tr. 1 = 0.00%; <sup>3</sup>contribution of the second spray to increasing the related first spray effectiveness – always the two treatments, only differing in use or non-use of the second spring spray, make up the pair for the mutual comparison; counted as effectiveness expressed according to Abbott's formula; the treatments which were sprayed only once (tr. 2–5) were scored as 0.00%; E – effectiveness; CL– confidence limit