

Supplementary Table 1. Geostatistical degree of dependence and best -fitted variogram models for *Adelphocoris lineolatus* and *Lygus rugulipennis* sampling data in alfalfa fields

Date of sampling	Field	<i>A. lineolatus</i>		<i>L. rugulipennis</i>	
		DD	Model	DD	Model
04-Jul-2016	A	-	No	-	No
07-Jul-2016	C	-	No	-	No
10-Jul-2016	A	-	No	-	No
14-Jul-2016	C	0	Li	-	No
17-Jul-2016	A	-	No	0	Li
19-Jul-2016	C	99.8	Sp	-	No
13-Aug-2016	A	-	No	53.5	Sp
15-Aug-2016	C	92.6	Sp	99.9	Ex
20-Aug-2016	A	99.7	Ex	0	Li
22-Aug-2016	C	99.9	Ex	0	Li
27-Aug-2016	A	-	No	-	No
29-Aug-2016	C	57.90	Sp	-	No
24-Jun-2017	D	99.9	Sp	66.6	Sp
25-Jun-2017	E	50	Ex	-	No
01-Jul-2017	D	84.1	Sp	-	0
02-Jul-2017	E	0	Li	-	0
03-Jul-2017	F	71.3	Ex	-	0
06-Aug-2017	D	-	No	-	0
07-Aug-2017	E	-	No	-	0
08-Aug-2017	F	100	Sp	-	0
12-Aug-2017	D	-	No	-	No
13-Aug-2017	E	-	No	-	No
14-Aug-2017	F	91.1	Sp	50	Ex
16-Sep-2017	D	-	No	-	No
17-Sep-2017	E	-	No	-	No
18-Sep-2017	F	82.5	Sp	82.5	Sp
23-Sep-2017	D	50	Sp	-	No
24-Sep-2017	E	-	No	73.9	Ex
25-Sep-2017	F	76.2	Sp	99.9	Sp

Ga: Gaussian model; Ex: Exponential model; Sp: Spherical model; Li: Linear model; No: no model; 0: Insect population was zero

Supplementary Table 2. Geostatistical degree of dependence and best -fitted variogram models as well as index of aggregation for *Pterostichus melanarius* sampling data in alfalfa fields

Date of sampling	Field	<i>P.melanarius</i>		
		DD	Model	I _a
17-Jul-2016	A	0	Li	0.673
19-Jul-2016	C	99.7	Ex	1.301
20-Aug-2016	A	56.5	Sp	1.301
22-Aug-2016	C	99.8	Sp	1.674*
27-Aug-2016	A	-	No	1.125
29-Aug-2016	C	-	No	0.859
05-Oct-2016	A	50	Ga	0.904
05-Oct-2016	C	0	Li	0.984
15-Oct-2016	A	-	No	0.785
15-Oct-2016	C	87.9	Ex	0.845
20-May-2017	D	50.7	Ex	1.397*
21-May-2017	E	-	No	1.237
21-Jun-2017	D	-	No	1.005
22-Jun-2017	E	0	Li	0.889
01-Jul-2017	D	50	Sp	1.348
02-Jul-2017	E	50	Ga	1.086
06-Aug-2017	D	0	Li	1.064
07-Aug-2017	E	-	No	1.184
16-Sep-2017	D	50	Ga	0.850
17- Sep -2017	E	56	Sp	0.689

Ga: Gaussian model; Ex: Exponential model; Sp: Spherical model; Li: Linear model; No: no model; *: Statistical significance of aggregation ($P < 0.05$), 0: Insect population was zero

Supplementary Table 3. Index of aggregation of plant bugs in alfalfa fields

Date of sampling		<i>Adelphocoris</i> <i>lineolatus</i>	<i>Lygus</i> <i>rugulipennis</i>
04-Jul-2016	A	1.526	0.917
05-Jul-2016	B	0.891	0.4012
07-Jul-2016	C	1.534*	1.529*
10-Jul-2016	A	1.333	0.3912
12-Jul-2016	B	1.639*	0.7112
14-Jul-2016	C	1.400*	1.395*
17-Jul-2016	A	0.821	0.5048
18-Jul-2016	B	1.462*	0.3796
19-Jul-2016	C	1.396*	1.399*
13-Aug-2016	A	1.242	0.4220
14-Aug-2016	B	0.880	0.903
15-Aug-2016	C	1.489*	0.800
20-Aug-2016	A	0.902	0.5557
21-Aug-2016	B	1.076	1.076
22-Aug-2016	C	0.937	0.821
27-Aug-2016	A	1.557*	0.4949
28-Aug-2016	B	1.064	0.868
29-Aug-2016	C	1.313	1.030
24-Jun-2017	D	1.406*	0.870
25-Jun-2017	E	0.813	0.929
01-Jul-2017	D	0.981	0
02-Jul-2017	E	0.986	0
03-Jul-2017	F	1.733*	0
06-Aug-2017	D	1.058	0
07-Aug-2017	E	1.029	0
08-Aug-2017	F	1.560*	0
12-Aug-2017	D	1.062	0.879
13-Aug-2017	E	1.796*	1.071
14-Aug-2017	F	1.284	0.972

*: Statistical significance of aggregation ($P < 0.05$), 0: Insect population was zero

Supplementary Table 4. Spatial association between *Acyrthosiphon pisum*, *Therioaphis maculata* and *Aphis craccivora*

Date of sampling	Field	<i>A. pisum</i> and <i>T. maculata</i>		<i>A. craccivora</i> and <i>A. pisum</i>		<i>A. craccivora</i> and <i>T. maculata</i>	
		X	P _x	X	P _x	X	P _x
04-Jul-2016	A	-0.1127	0.6952	-0.0117	0.2500	-0.0411	0.4988
05-Jul-2016	B	0.0506	0.2500	-0.2283	0.5000	0.5824	0.0267
07-Jul-2016	C	1	0.0001	1	0.0001	1	0.0001
10-Jul-2016	A	0.1082	0.2552	*	*	*	*
12-Jul-2016	B	0.1713	0.2500	-0.0917	0.5000	-0.0864	0.5539
14-Jul-2016	C	1	0.0001	1	0.0001	1	0.0001
17-Jul-2016	A	-0.0168	0.7500	*	*	*	*
18-Jul-2016	B	-0.0451	0.2500	-0.1084	0.2500	0.1233	0.2968
19-Jul-2016	C	1	0.0001	1	0.0001	1	0.0001
08-Aug-2016	A	-0.0758	0.2500	*	*	*	*
10-Aug-2016	B	0.1424	0.5000	0.2060	0.2500	-0.2035	0.8347
09-Aug-2016	C	0.0259	0.5000	*	*	*	*
13-Aug-2016	A	0.5144	0.2500	*	*	*	*
14-Aug-2016	B	0.2952	0.2500	*	*	*	*
15-Aug-2016	C	0.5627	0.2500	*	*	*	*
20-Aug-2016	A	0.6666	0.2500	*	*	*	*
21-Aug-2016	B	0.1352	0.5000	*	*	*	*
22-Aug-2016	C	0.7360	0.2500	*	*	*	*
27-Aug-2016	A	0.7400	0.2500	*	*	*	*
28-Aug-2016	B	0.6057	0.2500	*	*	*	*
29-Aug-2016	C	0.6019	0.2500	*	*	*	*
21-Jun-2017	D	-	-	*	*	*	*
22-Jun-2017	E	-	-	0.0618	0.2241	-0.1428	0.9054
23-Jun-2017	F	-	-	*	*	*	*
24-Jun-2017	D	-	-	*	*	*	*
25-Jun-2017	E	-	-	0.0047	0.4010	-0.0610	0.6932
26-Jun-2017	F	-	-	-0.2154	0.7847	*	*
01-Jul-2017	D	-0.0309	0.5683	0.0072	0.4498	*	*
02-Jul-2017	E	-0.0389	0.6130	*	*	*	*
03-Jul-2017	F	0.0745	0.2813	*	*	*	*
30-Jul-2017	D	0.2241	0.0276	0.0938	0.1900	-0.0783	0.7497
31-Jul-2017	E	-0.0911	0.8244	*	*	*	*
01-Aug-2017	F	-0.0227	0.5469	*	*	*	*
06-Aug-2017	D	0.0724	0.2392	0.0335	0.3702	-0.0107	0.5043
07-Aug-2017	E	-0.3383	0.9989	*	*	*	*
08-Aug-2017	F	0.4837	0.0001	0.0236	0.4308	0.2242	0.0474
12-Aug-2017	D	0.0536	0.2930	*	*	*	*
13-Aug-2017	E	-0.0475	0.6427	*	*	*	*
14-Aug-2017	F	0.2396	0.0441	-0.0727	0.6842	-0.375	0.5855
10-Sep-2017	D	0.0173	0.4328	*	*	*	*
11-Sep-2017	E	0.0027	0.4783	*	*	*	*
12-Sep-2017	F	0.0221	0.4171	*	*	*	*
16-Sep-2017	D	0.1322	0.1182	*	*	*	*
17-Sep-2017	E	0.6224	0.0001	*	*	*	*
18-Sep-2017	F	0.3090	0.0121	*	*	*	*
14-Sep-2017	E	0.0480	0.3406	*	*	*	*
23-Sep-2017	D	0.1322	0.1257	*	*	*	*
25-Sep-2017	F	0.3624	0.0036	*	*	*	*

X, index of spatial association; *P_x*, *P* values of *X*, (-): different date of sampling, *: no population of *A. craccivora*
 (-) dashed lines indicate alfalfa harvest times.

Supplementary Table 5. Spatial association between *Therioaphis maculata* and Coccinellids (*Coccinella septempunctata* and *Hippodamia variegata*)

Date of sampling	Field	<i>T. maculata</i> and <i>H. variegata</i>		<i>T. maculata</i> and <i>C. septempunctata</i>	
		X	P _x	X	P _x
04-Jul-2016	A	0.054	0.2989	0.1944	0.1420
05-Jul-2016	B	0.3119	0.0722	0.2337	0.1332
07-Jul-2016	C	1	0.0001	1	0.0001
10-Jul-2016	A	-0.1589	0.8106	0.0336	0.4341
12-Jul-2016	B	0.4064	0.0708	0.2745	0.1198
14-Jul-2016	C	1	0.0001	1	0.0001
17-Jul-2016	A	-	-	0.1495	0.2085
18-Jul-2016	B	0.3856	0.0301	0.1074	0.3163
19-Jul-2016	C	1	0.0001	1	0.0001
08-Aug-2016	A	-0.1239	0.7562	-0.1239	0.7562
10-Aug-2016	B	-0.1658	0.7653	-0.1533	0.7659
09-Aug-2016	C	-0.1282	0.9481	-0.0219	0.0219
13-Aug-2016	A	0.1542	0.1689	0.1542	0.1689
14-Aug-2016	B	-0.0511	0.5580	-0.0350	0.5482
15-Aug-2016	C	0.0735	0.2974	0.4805	0.4805
20-Aug-2016	A	-0.1916	0.9088	0.2585	0.0561
21-Aug-2016	B	0.0583	0.3770	0.0316	0.4160
22-Aug-2016	C	-0.0382	0.5204	0.3023	0.3023
27-Aug-2016	A	0.1068	0.2367	0.3434	0.0198
28-Aug-2016	B	0.1759	0.2134	0.4370	0.0258
29-Aug-2016	C	0.5799	0.0001	0.3908	0.3908
01-Jul-2017	D	-0.2138	0.9944	-0.1596	0.9567
02-Jul-2017	E	0.1664	0.0812	0.4474	0.4474
03-Jul-2017	F	0.0027	0.4613	0.5012	0.5012
30-Jul-2017	D	0.3639	0.0004	0.1311	0.1311
31-Jul-2017	E	0.0575	0.6270	0.0501	0.0501
01-Aug-2017	F	0.0468	0.3510	0.0199	0.0199
06-Aug-2017	D	0.2358	0.0380	0.3638	0.3638
07-Aug-2017	E	0.1936	0.0718	0.4146	0.4146
08-Aug-2017	F	0.0938	0.2357	0.2429	0.2429
12-Aug-2017	D	0.3026	0.0067	0.0274	0.0274
13-Aug-2017	E	0.2856	0.0080	0.2504	0.2504
14-Aug-2017	F	0.1576	0.1306	0.0536	0.0536
10-Sep-2017	D	-0.0383	0.6143	0.7073	0.7073
11-Sep-2017	E	0.0756	0.2546	0.0387	0.0387
12-Sep-2017	F	0.0946	0.2234	0.1163	0.1163
16-Sep-2017	D	0.4349	0.0022	0.0348	0.0348
17-Sep-2017	E	0.2060	0.04002	0.0213	0.0213
18-Sep-2017	F	0.1816	0.0783	0.3863	0.3863
14-Sep-2017	D	0.3892	0.0005	0.0076	0.0076
23-Sep-2017	E	0.0696	0.2699	0.955	0.0955
25-Sep-2017	F	0.0214	0.4174	0.2376	0.2376

X, index of spatial association; *P_x*, *P* values of *X*

(-) dashed lines indicate alfalfa harvest times.

Supplementary Table 6. Spatial association between *Acyrtosiphon pisum*, *Therioaphis maculata* and *Pterostichus melanarius*

Date of sampling	field	<i>T. maculata</i> and <i>P. melanarius</i>		<i>A. pisum</i> and <i>P. melanarius</i>	
		X	P _x	X	P _x
17-Jul-2016	A	-0.0990	0.6895	-0.0629	0.2500
18-Jul-2016	B	-0.3573	0.9606	-0.1704	0.7500
19-Jul-2016	C	1	0.0001	0.3335	0.0001
20-Aug-2016	A	-0.1650	0.8623	0.1193	0.2500
21-Aug-2016	B	0.1327	0.2546	-0.1175	0.2500
22-Aug-2016	C	0.1088	0.2330	0.1294	0.2500
27-Aug-2016	A	0.6136	0.6136	-0.0271	0.2500
28-Aug-2016	B	0.0007	0.4699	1	0.7500
29-Aug-2016	C	0.0096	0.4424	0.0198	0.2500
21-Jun-2017	D	-	-	0.0198	0.4420
01-Jul-2017	D	0.1253	0.2140	-0.1170	0.7309
02-Jul-2017	E	-0.2905	0.9310	0.2533	0.0999
03-Jul-2017	F	0.0078	0.4507	0.4089	0.0009
06-Aug-2017	D	0.0638	0.2926	-0.1170	0.6672
07-Aug-2017	E	-0.0119	0.4626	-0.1835	0.8203
08-Aug-2017	F	0.0930	0.2329	0.0670	0.2942
16-Sep-2017	D	0.0207	0.4619	-0.2144	0.9057
17-Sep-2017	E	-0.0817	0.6795	-0.2027	0.8387
18-Sep-2017	F	0.0473	0.3234	0.2341	0.0395

X, index of spatial association; P_x, P values of X, (-): different date of sampling.

(-) dashed lines indicate alfalfa harvest times.