ANNEX 12

MONITORING STUDY OF POTATO-FEEDING ORGANISMS IN COMMERCIALLY CULTIVATED AMFLORA POTATO FIELDS AND THEIR CLOSE VICINITY IN GERMANY AND SWEDEN

Final Report

Monitoring study of potato-feeding organisms in commercially cultivated Amflora potato fields and their close vicinity in Germany and Sweden

Non-GLP Trial

Authors

(Names deleted)

RIFCON GmbH Report No.

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AMF-11-001

Study Completion Date

15 February 2012

Sponsor

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CERTIFICATION OF AUTHENTICITY

I hereby declare that the results presented in this report completely and truly reflect the data recorded during the in-life part of the study.

SIGNATURE PART DELETED

DATA CONFIDENTIALITY STATEMENT

This document is confidential. No part of the document or any information contained herein may be disclosed to any third party without the prior written authorisation of the sponsor.

SUMMARY

Author(s) (year)	K. Henkes and G. Henkes (2012)
Title	Monitoring study of potato-feeding organisms in commercially cultivated Amflora potato fields and their close vicinity in Germany and Sweden
Owner, Date	BASF Plant Science Company GmbH, unpublished RIFCON GmbH Report No. R11084, 15 February 2012
Test Facility	RIFCON GmbH, Im Neuenheimer Feld 517, 69120 Heidelberg, Germany
Dates of field work	12 July 2011 to 01 August 2011
Test item	Amflora potato (*Solanum tuberosum* L. of the line EH92-527-1; BASF)
Guidance	Sampling of aphids were conducted in accordance with 'EPPO Standard PP 1/230 (1) 'Aphids on potatoes'' (EPPO, 2005).
GLP	No
RIFCON GmbH Study No.	P11084
BASF Project No.	AMF-11-001

Aim

The objective of this study was to monitor selected potato-feeding organisms naturally occurring on Amflora potato (*Solanum tuberosum* L. line EH92-527-1) fields and in their vicinity. The abundance of potato aphids and other common phytophagous arthropods was investigated in one potato field in Germany and in three fields in Sweden (all fields for seed potato multiplication), focusing on adults and larval stages. Furthermore, potato aphids were determined on species level and other common phytophagous arthropods were classified in main taxonomic groups (e.g. Chrysomelidae, Aphididae, Heteroptera, Auchenorrhyncha, Collembola). Colorado potato beetles were not investigated separately, because no Colorado potato beetles were found in the potato fields in Germany and Sweden during the sampling period of the Amflora monitoring study in 2010 (Schneider and Henkes, 2011). However, the total abundance of phytophagous beetles was obtained in the present study.

Material and Methods

Study sites

The study was conducted in two different commercial potato cultivation areas:

1. One field in Germany (near Üplingen)

2. Three fields in Sweden (one in the north near Nedre Vojakkala; two in the south near Skallmeja and Vinninga)

The potato fields in Germany and Sweden were established for commercial multiplication of seed potatoes.

Arthropod sampling

Twelve transects per potato field were established, six within each potato field (n=6) and six at the potato field margins representing the vicinity of the potato field (n=6). Transects within the potato field consisted of three neighboring potato rows: one row for sampling of phytophagous arthropods (suction sampling) and one row for potato aphid sampling (hand sorting), separated by a buffer row. Within these rows aphids were sampled from ten neighboring plants. For suction sampling of phytophagous arthropods 10 plants were sampled within each transect.
Transects representing the vicinity of the potato field consisted of the outer row of the potato field. Along this row phytophagous arthropods and potato aphids were sampled consecutively.

Potato aphids were sampled in accordance with EPPO Standard PP 1/ 230 (1) 'Aphids on potatoes' from 30 leaves taken from 10 different potato plants per transect (EPPO, 2005).

Phytophagous arthropods were sucked off ten potato plants per transect by a D-Vac suction sampler (manufacturer: STIHL, Germany; Brook et al. 2008, Koss et al. 2005).

Calculation and statistics

Abundances of potato aphid species and other phytophagous arthropods (e.g. Collembola, Heteroptera, Auchenorrhyncha, Chrysomelidae) were given for each transect (mean value per ten plants with standard deviation). Additionally, the relative abundance of phytophagous arthropods was presented.

Results

In Germany aphid abundance varied from 0.00 to 4.00 individuals per transect. In Southern Sweden the abundance of potato aphids was strongly higher in potato field SE02 (14-230 individuals per transect) than in potato field SE01 (0-19 individuals per transect). Furthermore, aphid abundances within the potato field (n=6) and the vicinity of the potato field (outer row of the fields; n=6) did not differ strongly, due to high variations between single transects. No potato aphids were found applying the hand sorting method at the potato field in Northern Sweden (SE03).

Only one potato aphid species (*Myzus persicae*) was found in the German potato field, whereas two other potato aphid species (*Aphis nasturii* and *Aphis frangulae*) were found in the Southern Swedish potato fields.

The highest abundance of arthropods was sampled by D-Vac suction at the German potato field DE01 with 193.17 ± 69.96 arthropods per transect (n=12). In contrast the lowest abundances of arthropods (33.58 ± 16.95 individuals per transect, n=12) were found at one of the potato fields in Southern Sweden (SE02). However, only 48% of all arthropods sampled by suction sampling at the potato field in Germany (DE01) were phytophagous. In contrast, 70% of all arthropods sampled by this method at the other potato field in Southern Sweden (SE01) were phytophagous.

The abundance of aphids sampled by D-Vac suction spanned over a wide range from 2.42 ± 2.35 (SE03) to 85.42 ± 44.67 (SE01) individuals per transect (n=12) in the potato field in Northern Sweden.

Furthermore, the number of aphids sampled by D-Vac suction within the potato field (n=6) and in the vicinity of the potato field (outer row of the field, n=6) did not differ strongly, due to high variations between single transects.

The abundances of most other phytophagous arthropod groups (e.g. Miridae, Heteroptera, Auchenorrhyncha and Collembola) were very low at all potato fields. In contrast, the abundance of Thysanoptera varied strongly between the potato fields in the two geographic regions (Germany and Sweden). The highest abundances were found at the potato field in Germany. Furthermore, the abundance of Thysanoptera were higher in the vicinity of the German potato field (94.20 ± 27.80 individuals per transect; n=6) than in transects within the potato field (48.80 ± 16.70 individuals per transect; n=6).

Conclusion

The current study provides field data on the abundances of phytophagous arthropods at four Amflora fields in two different countries (Germany and Sweden). The data proved the suitability of the methods (D-Vac suction sampling and hand sorting) used to sample phytophagous arthropods (e.g. potato aphids, Thysanoptera, Heteroptera, Collembola and Auchenorrhyncha).

The abundance of phytophagous arthropods in Amflora potato fields differed strongly between the different commercial potato cultivation areas in Germany and Sweden. The highest abundances were found at the potato field in Germany. The lowest number of individuals was mostly counted at the potato field in Northern Sweden. Furthermore, differences were found between abundances of phytophagous arthropods sampled within the Amflora fields and in the vicinity of the Amflora fields. However, the abundance of phytophagous arthropods in Amflora potato fields varied strongly between transects and therefore differences are not significant.

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1 GENERAL

1.1 Sponsor

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1.2 Test Facility

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1.3 Test Site (Germany)

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Sweden

1.5 Responsibilities

Sponsor (BASF Plant Science Company GmbH)

Representative of the Sponsor:	Dr. A. Heise

Test Facility (RIFCON GmbH)

Management:	Dr. M. Riffel
Study Director:	Dr. K. Henkes
Principal Investigator:	Dr. G. Henkes
Field staff:	M. Schneider (SunGene GmbH), I. Schwabe (SunGene GmbH)

Test Site (Germany)

Contact person: M. Klings

Test Site (Sweden)

Contact person: A. Martensson

1.6 Dates

Study initiation date:	07 July 2011
Experimental starting date of Sampling Phase:	12 July 2011
Experimental completion date of Sampling Phase:	01 August 2010
Experimental starting date of Sorting and Determination Phase:	19 July 2011
Experimental completion date of Sorting and Determination Phase:	22 August 2011
Study completion date:	15 February 2012

1.7 Archiving

The original of the Study Plan, the raw data and the Final Report will be archived at the Test Facility (RIFCON GmbH, Im Neuenheimer Feld 517, 69120 Heidelberg, Germany).

2 INTRODUCTION

The objective of this study was to monitor selected potato-feeding organisms naturally occurring on Amflora potato (*Solanum tuberosum* L. EH92-527-1) fields and in their vicinity. The abundance of potato aphids and other common phytophagous arthropods was investigated in one potato field in Germany and in three fields in Sweden (all fields for seed potato multiplication), focusing on adults and larval stages. Furthermore, potato aphids were determined on species level and other common phytophagous arthropods were classified in main taxonomic groups (e.g. Chrysomelidae, Aphididae, Heteroptera, Auchenorrhyncha, Collembola).

3 OBJECTIVES

- To monitor the abundance of potato-feeding arthropods (Aphids, Collembola, Heteroptera, Auchenorrhyncha, Chrysomelidae) in Amflora potato fields and in their vicinity.
- To monitor the abundance and diversity of aphids (including larvae) in Amflora potato fields and in their vicinity.

4 MATERIAL AND METHODS

4.1 Test item

The potato line EH92-527-1 has been genetically modified for an increased amylopectin content in the tuber starch. The mother starch potato variety Prevalent was transformed with a construct containing a gene fragment encoding granule bound starch synthase from potato in reverse orientation under the control of the potato granule bound starch synthase promoter. A kanamycin resistance gene from *Escherichia coli* under the control of the nopaline synthase promoter from *Agrobacterium tumefaciens* allowed selection of the transformant in tissue culture. The potato line with the variety name Amflora was approved for commercial cultivation in the European Union in March 2010.

4.2 Test organisms

The study focused on natural populations of potato aphids (*Myzus persicae*, *Aphis nasturii, Aphis frangulae, Aphis fabae, Aulacorthum solani, Macrosiphum euphorbiae*), and other phytophagous arthropods. Potato aphids, larvae, winged and wingless individuals were taken into account, and adult potato aphids were determined on species level. Other phytophagous arthropods (e.g. Collembola, Heteroptera, Auchenorrhyncha, Chrysomelidae), besides aphids, were recorded at the highest taxonomic level where appropriate and dependent on their overall abundance.

4.3 Study sites and study design

The study was conducted in two different commercial potato cultivation areas:

1. One field in Germany (near Üplingen)
2. Three fields in Sweden (one in the north near Nedre Vojakkala; two in the south near Skallmeja and Vinninga)

The German potato field was located near Üplingen, approx. 52 km west of Magdeburg (Saxony-Anhalt; Table 1, Figure 1, Appendix 1, Appendix 10).

One of the two potato fields in Southern Sweden was located near Skallmeja, approx. 16 km south of Lidköping, the other potato field was located near Vinninga, approx. 10 km south of Lidköping (Table 1, Figure 2, Figure 3, Appendix 2, Appendix 4, Appendix 5, Appendix 10). The potato field in north Sweden was located near Nedre Vojakkala, approx. 10 km north of Haparanda (Table 1, Figure 4, Appendix 3, Appendix 6, Appendix 10).

Details on the location of the potato fields at all study sites (e.g. field name, field size, planting date) were provided by the sponsor (Table 1).

Table 1: Information on the four potato fields in Germany (DE) and Sweden (SE)

Study field code	Sampling date [dd.mm.yyyy]	BBCH macro stage*	Study field**	Location	Planted area** [ha]	Potato planting date [dd.mm.yyyy]**
DE01	12.07.2011	55	-	Üpling	3.69	07.05.2011
SE01	13.07.2011	55	11STAMSE5SKA001	Skallmeja	2.58	08.05.2011
SE02	13.07.2011	55	11STAMSE5VIN001	Vinninga	2.45+2.75	07.05.2011
SE03	01.08.2011	55	11STAMSE5VOJ001	Vojakkala	5.41	09.-11.6.2011

*at time of sampling (Meier, 2001) ** information was provided by the sponsor

Figure 1: Impression of the potato field DE01 in Germany with twelve transects

Transect 1-6 within the potato field (GPS-position was taken at the middle of each transect), transect A-F in the vicinity of the potato field (outer row of the potato field; GPS-position was taken at the beginning of each transect).

Figure 2: Impression of the potato field SE01 in Southern Sweden with twelve transects

Transect 1-6 within the potato field (GPS-position was taken at the middle of each transect), transect A-F in the vicinity of the potato field (outer row of the potato field; GPS-position was taken at the beginning of each transect).

Figure 3: Impression of the potato field SE02 in Southern Sweden with twelve transects

Transect 1-6 within the potato field (GPS-position was taken at the middle of each transect), transect A-F in the vicinity of the potato field (outer row of the potato field; GPS-position was taken at the beginning of each transect).

Figure 4: Impression of the potato field SE03 in north Sweden with twelve transects

Transect 1-6 within the potato field (GPS-position was taken at the middle of each transect), transect A-F in the vicinity of the potato field (outer row of the potato field; GPS-position was taken at the beginning of each transect).

4.4 Agricultural practice

During the course of the study herbicides, fungicides and insecticides were applied in accordance with Good Agricultural Practice (GAP). For details of agricultural activities and pesticide treatments, see Appendix 8 to Appendix 9. Information was provided by the sponsor.

4.5 Study design

Twelve transects per potato field were established, six within each potato field (n=6; transect 1-6) and six at the potato field margins representing the vicinity of the study field (n=6; transect A-F; Figure 1 to Figure 4). Transects within the potato field consisted of three neighboring potato rows: one row for sampling of phytophagous arthropods (suction sampling) and one row for potato aphid sampling (hand sorting), separated by a buffer (Figure 5). Transects in the vicinity of the potato field consisted of the outer row of the potato field. Along this row phytophagous arthropods and potato aphids were sampled consecutively. The distance between transects was at least 10 meters. Furthermore, the distance from the edges of the field to the transects within the potato field was also at least 10 meters. Transects were distributed over the entire field, therefore the size and shape of transects depended on the geometry of the field. The length of transects was at least the length of 20 neighboring plants. Within these rows the aphid monitoring was conducted on 10 neighboring plants. For suction sampling of phytophagous arthropods 10 neighboring plants were also sampled. For details of the GPS-positions of the transects see Appendix 10.

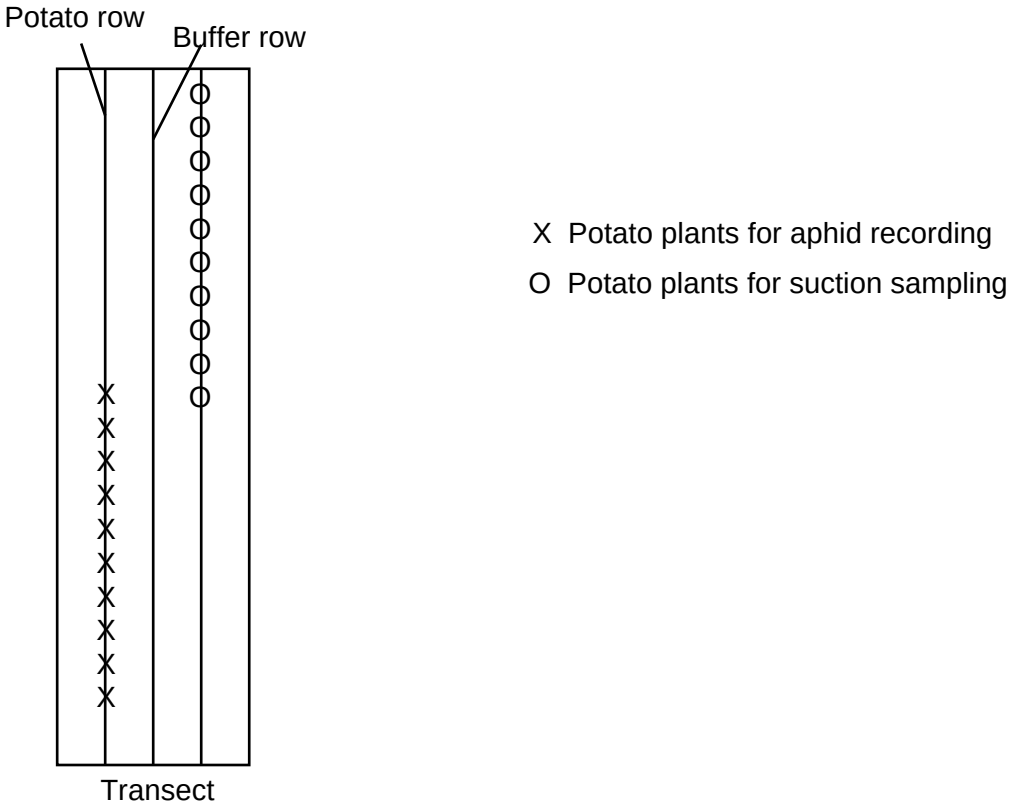


Figure 5: Exemplary scheme of a transect design within the potato field

4.6 Arthropod sampling, counting and identification

4.6.1 Sampling, counting and identification of aphids

Recording of potato aphids was conducted in accordance with EPPO Standard PP 1/ 230 (1) 'Aphids on potatoes' (EPPO, 2005). The potato aphid population was assessed for 30 leaves taken from 10 different potato plants per transect. The leaves were equally collected from the upper, central and lower parts of the potato plants. All aphids (larvae and adults) per transect (30 leaves) were counted in the potato field. Adult individuals which could not be determined within the study field were transferred in 70% ethanol for later species identification in the laboratory. The sampling bottles were uniquely labeled with study number, sampling date, the field and transect number.

Adult potato aphids were determined to species level (*Myzus persicae*, *Aphis nasturii, Aphis frangulae, Aphis fabae, Aulacorthum solani, Macrosiphum euphorbiae*). All of these species are common on potato and other crop plants throughout Europe (Blackmann, 2000). For identification of aphids the following keys were used:

Völk, J. (1965): Die häufigsten an der Kartoffel vorkommenden Blattlausarten in farbiger Darstellung. Biologische Bundesanstalt für Land- und Forstwirtschaft, Merkblatt Nr. 14, Institut für landwirtschaftliche Virusforschung, Braunschweig, Germany.

Dubnik, H. (1991): Blattläuse – Artenbestimmung- Biologie- Bekämpfung. Mann, Gelsenkirchen-Buer, Germany.

4.6.2 Suction sampling of phytophagous arthropods

Phytophagous arthropods were sucked off ten potato plants by a D-Vac suction sampler (manufacturer: STIHL, Germany; Appendix 7; Brook et al. 2008, Koss et al. 2005). The collector was equipped with a combustion engine. The throughput could be continuously regulated by a gas handle. The suction tube was equipped with a sampling bag that could easily be changed. Each transect was suctioned for approx. 2 min by placing the D-vac collecting tube over that plant and shaking vigorously. Each plant was suctioned twice. An ether soaked tampon was hung inside the polyethylene sampling bottle to kill the arthropods. Each sample was transferred in 70% ethanol for later identification in the laboratory. The sampling bottles were uniquely labeled with study number, sampling date, the field and transect number.

4.7 Weather data

The weather data of July 2011 for Germany were obtained from the nearest weather recording station in Ummendorf (daily min, max and mean temperature; GPS data, UTM, WGS 84: 32 U 648884 5781257) and Barneberg (daily precipitation; GPS data, UTM, WGS 84: 32 U 642372 5776080) each approx. 8 km from the potato field (DE01). Both weather stations were operated by the "Deutscher Wetterdienst" (Source: http://premium.dwd.de/weste/xl_1.jsp).

The weather data of July and August 2011 for Sweden were provided by BASF Plant Science Company GmbH (Source: www.klart.se). Precipitation and mean temperature was obtained for Vojakkala in Northern Sweden and Vinninga in Southern Sweden.

5 DATA EVALUATION

Abundances of potato aphid species and other phytophagous arthropods (e.g. Collembola, Heteroptera, Auchenorrhyncha and Thysanoptera) were given for each transect (mean value per ten plants with standard deviation). Additionally, the relative abundance of phytophagous arthropods was calculated for each transect.

6 RESULTS

6.1 Abundance and diversity of aphids (hand sorting)

Only few potato aphids were found at the potato field in Germany (0.50 ± 1.17 individuals per transect; n=12; Figure 6). In Southern Sweden the total abundance of potato aphids was very high at the potato field near Vinninga (SE02) with 77.33 ± 61.52 individuals per transect (n=12; Figure 6). In contrast only few potato aphids were found at the potato field near Skallmeja (SE01; 5.92 ± 7.32 individuals per transect, n=12; Figure 6). No potato aphids were obtained from the potato field in Northern Sweden (SE03; n=12; Figure 6).

The total aphid abundance within the German potato field (DE01) was approx. five times higher within the potato field (0.17 ± 0.41 individuals per transect) than in the vicinity of the

German potato field (0.83 ± 1.60 individuals per transect; Figure 6). Also the total aphid abundance of the first potato field in Southern Sweden (SE01) was approx. five times lower within the potato field (2.00 ± 4.90 individuals per transect; n=6) than in the vicinity of the potato field (9.83 ± 7.55 individuals per transect; n=6; Figure 6). Aphid abundance was doubled in the vicinity of the second potato field in Southern Sweden (SE02; 106.00 ± 72.00 individuals per transect; n=6) compared with the transects within the potato field (48.67 ± 34.23 individuals per transect; n=6; Figure 6). However, these differences are not significant, due to the high variance between the single transects (standard deviation).

One potato aphid species (*Myzus persicae*) was found at the potato field in Germany (DE01; Figure 7) with a total abundance of 0.50 ± 1.17 individuals per transect (n=12; Figure 8). In Southern Sweden (SE01 and SE02) two aphid species (*Aphis nasturii and Aphis frangulae*) were found, whereas in north Sweden (SE03) no potato aphid species was found (Figure 7). The abundance of *A. frangulae* was strongly higher at the potato field SE02 (72.33 ± 61.23 individuals per transect; n=12) compared with the potato field SE01 (0.33 ± 0.89 individuals per transect; n=12; Figure 9). In contrast, the abundance of *A. nasturii* was similar at both potato fields in Southern Sweden (SE01: 5.58 ± 6.79 individuals per transect; SE02: 5.00 ± 4.61 individuals per transect; n=12; Figure 10).

The abundance of *M. persicae* was approx. five times higher in the vicinity of the German potato field (0.83 ± 1.60 individuals per transect; n=6) than within the German potato field (0.17 ± 0.41 individuals per transect; n=6; Figure 8). Also, the abundance of *A. frangulae* was strongly higher in the vicinity of the Swedish potato field SE02 (102.50 ± 70.32 individuals per transect; n=6) than within the potato field (42.17 ± 33.46 individuals per transect; n=6; Figure 9). At the Swedish potato field SE01 *A. frangulae* was found only in the vicinity of the potato field (0.67 ± 1.21 individuals per transect; n=6; Figure 9). The abundance of *A. nasturii* was strongly lower within the Swedish potato field SE01 (2.00 ± 4.90 individuals per transect; n=6) than in the vicinity of the potato field (9.17 ± 6.82 individuals per transect; n=6; Figure 10). In contrast, the abundance of *A. nasturii* was strongly higher within the Swedish potato field SE02 (6.50 ± 5.65 individuals per transect; n=6) compared to the vicinity of the potato field (3.50 ± 3.08 individuals per transect; n=6; Figure 10).

For details on the abundance of potato aphids, see Appendix 15 to Appendix 17.

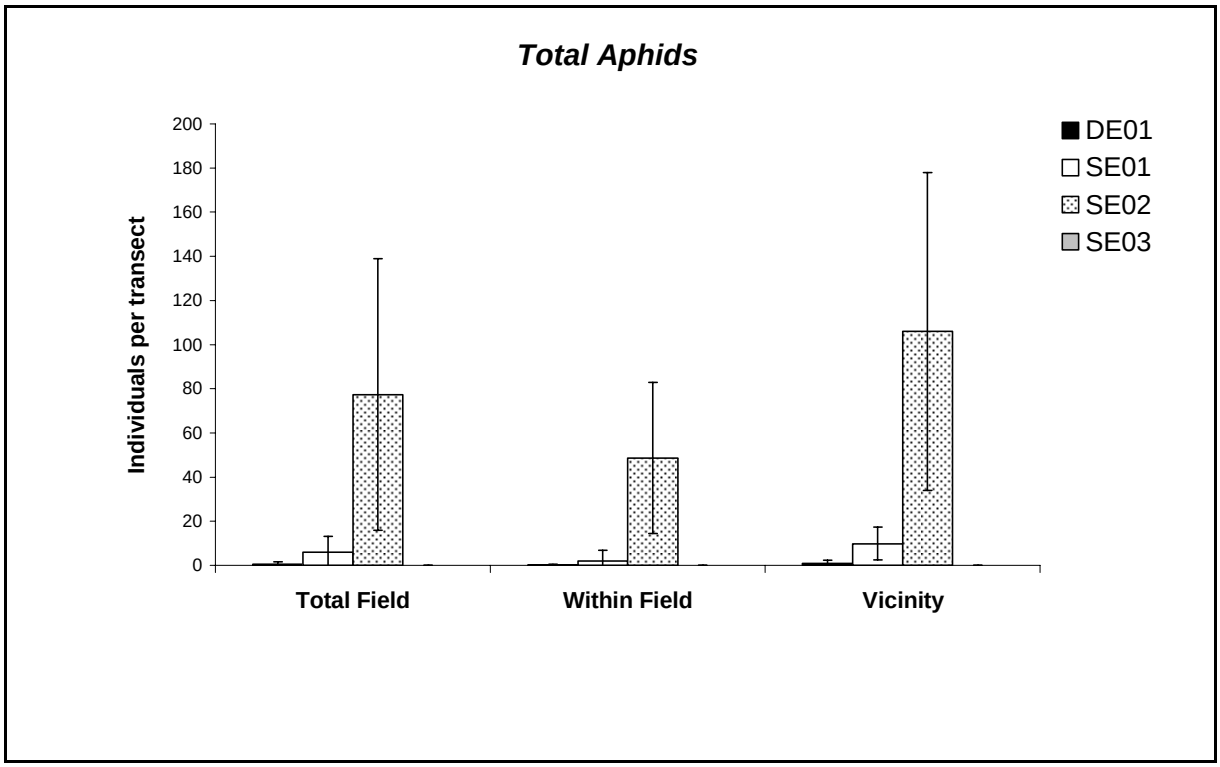


Figure 6: Mean abundance (±SD) of potato aphids within the potato fields and in their vicinity in Germany (DE) and Sweden (SE)

Means over twelve transects for 'Total Field' (n=12), six transects for 'Within Field' (n=6) and six transects for 'Vicinity' (n=6). Thirty leaves were sampled per transect.

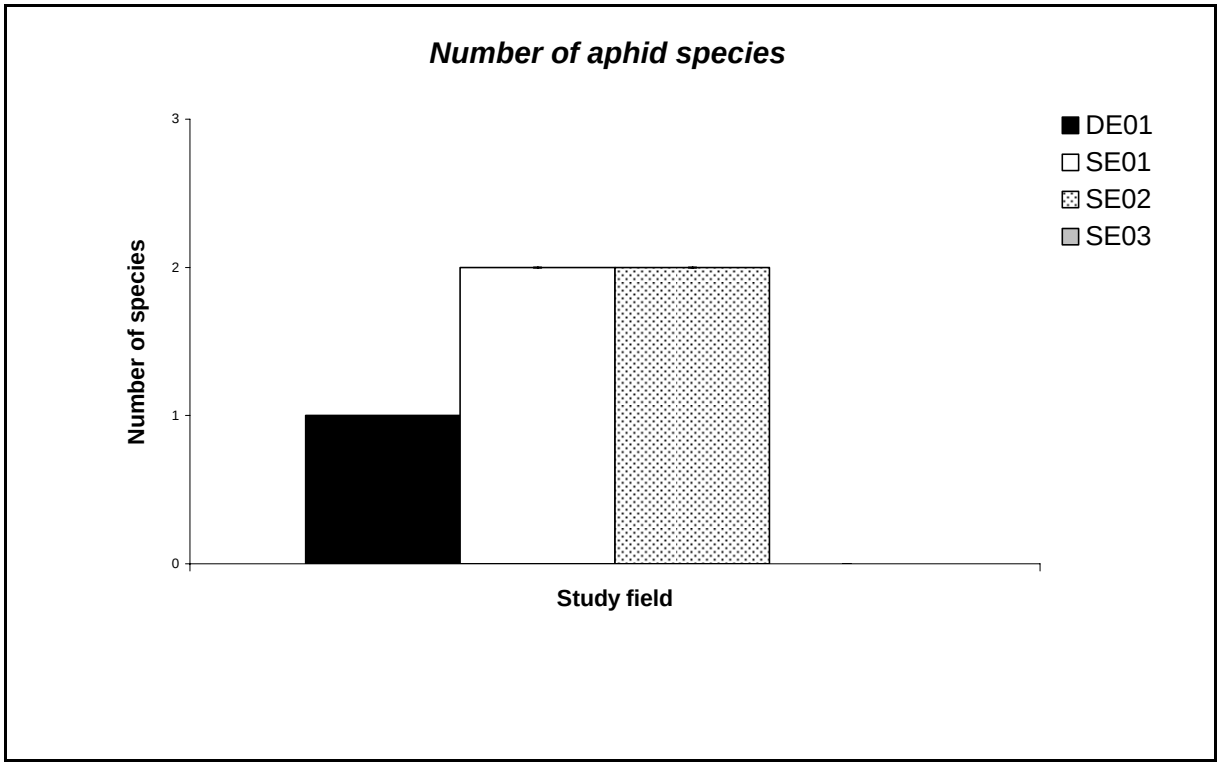


Figure 7: Number of potato aphid species of the potato fields in Germany (DE) and Sweden (SE)

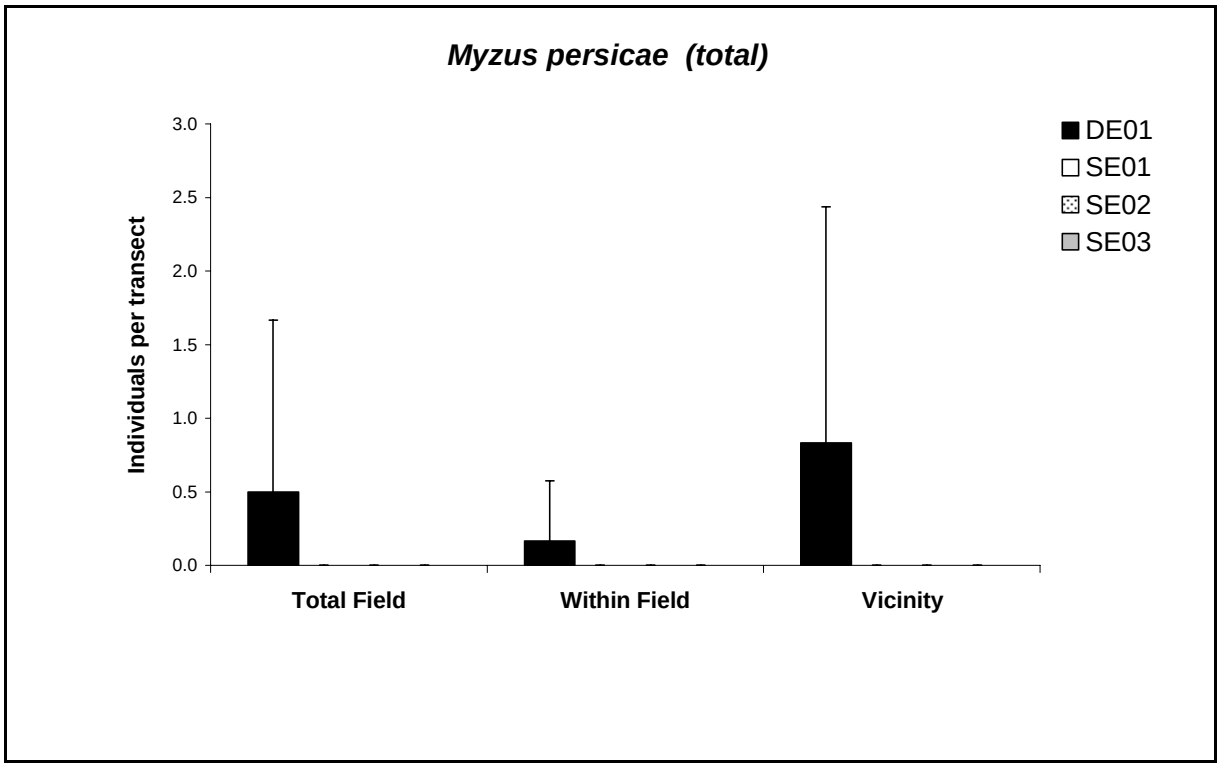


Figure 8: Mean abundance (±SD) of *Myzus persicae* within the potato fields and in their vicinity in Germany (DE) and Sweden (SE)

Means over twelve transects for 'Total Field' (n=12), six transects for 'Within Field' (n=6) and six transects for 'Vicinity' (n=6). Thirty leaves were sampled per transect.

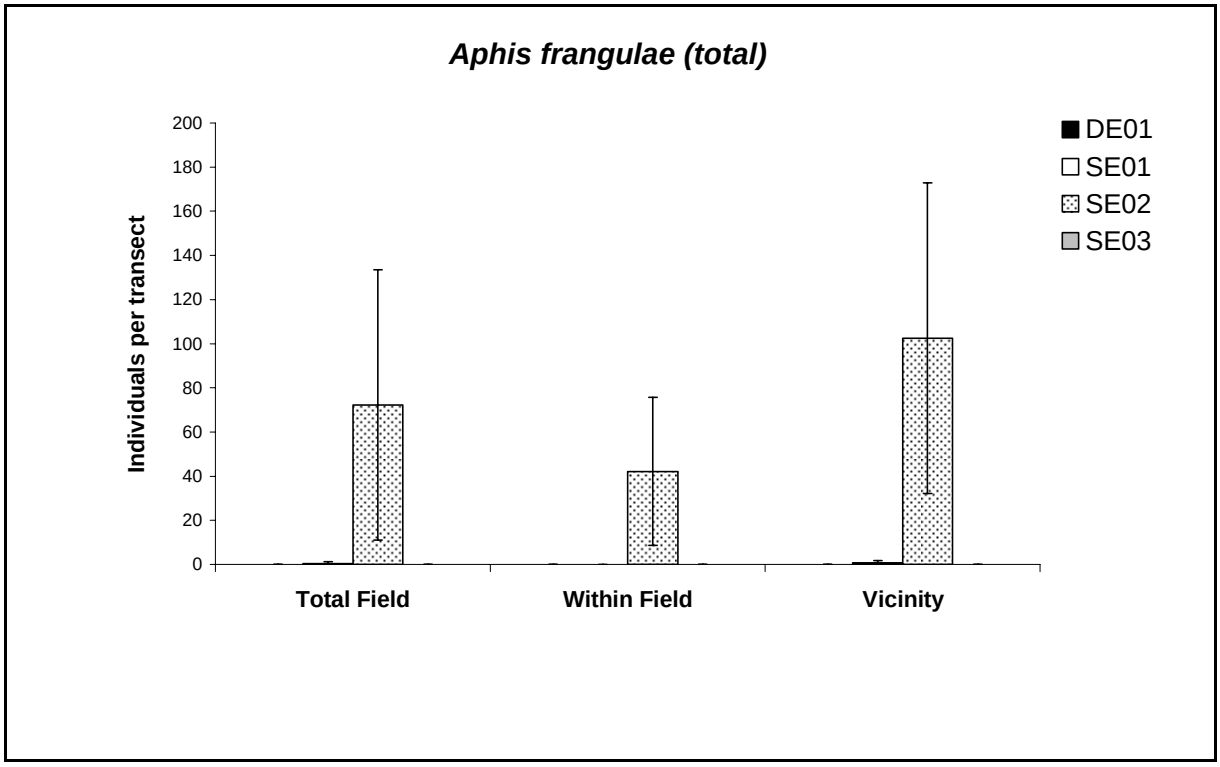


Figure 9: Mean abundance (±SD) of *Aphis frangulae* within the potato fields and in their vicinity in Germany (DE) and Sweden (SE)

Means over twelve transects for 'Total Field' (n=12), six transects for 'Within Field' (n=6) and six transects for 'Vicinity' (n=6). Thirty leaves were sampled per transect.

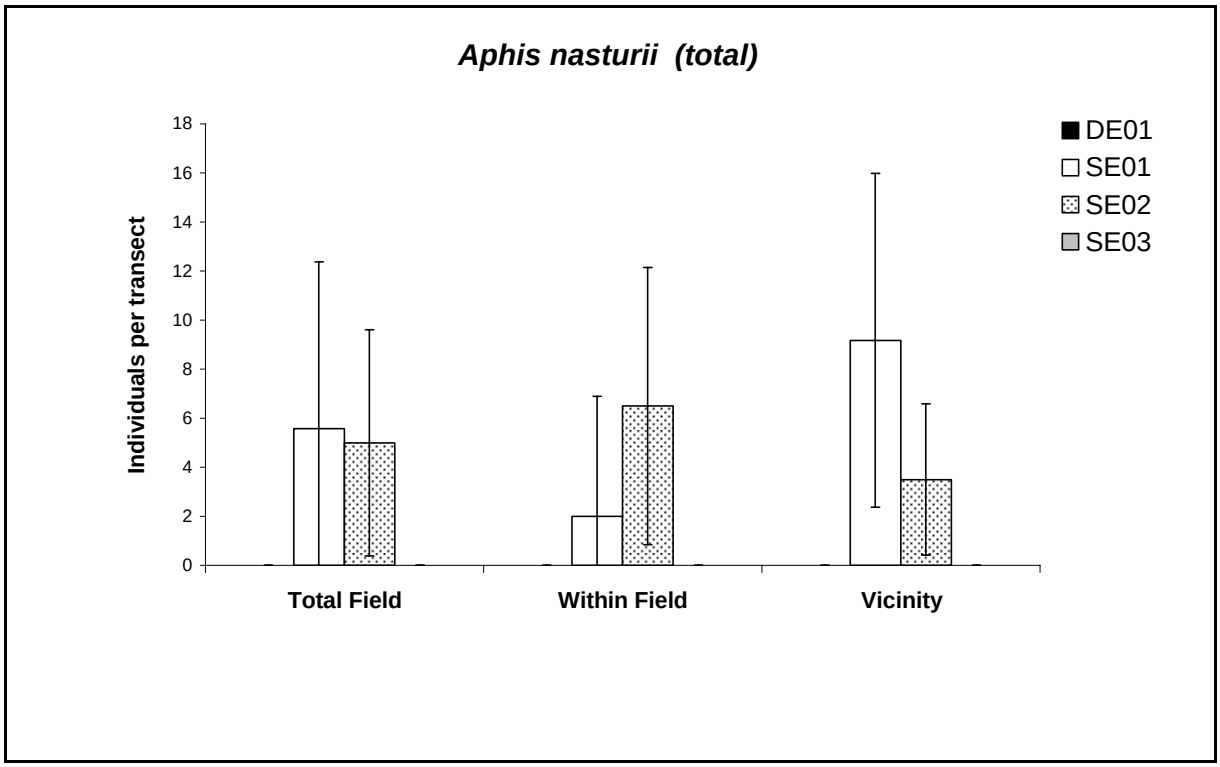


Figure 10: Mean abundance (±SD) of *Aphis nasturii* within the potato fields and in their vicinity in Germany (DE) and Sweden (SE)

Means over twelve transects for 'Total Field' (n=12), six transects for 'Within Field' (n=6) and six transects for 'Vicinity' (n=6). Thirty leaves were sampled per transect.

6.2 Abundance of phytophagous arthropods (suction sampling)

The total abundance of arthropods sampled by a D-Vac suction sampler varied between the potato fields in the different Amflora potato cultivation regions (Figure 11). The highest abundance of arthropods was found at the German potato field DE01 with 193.17 ± 69.96 arthropods per transect (n=12). In contrast one of the potato fields in Southern Sweden (SE02) had the lowest abundances of arthropods (33.58 ± 16.95 individuals per transect, n=12). The total arthropod abundance of the second potato field in Southern Sweden (SE01) and in Northern Sweden (SE03) was similar with 130.92 ± 43.92 and 125.00 ± 35.96 individuals per transect (n=12), respectively. However, of all arthropods sampled by suction sampling at the potato field in Southern Sweden (SE02) and Germany (DE01), only 25% (8.75 ± 7.00 individuals per transect, n=12) and 48% (93.08 ± 46.19 individuals per transect, n=12), respectively, were phytophagous (Figure 12 and Figure 13). In contrast, 70% (94.92 ± 44.90 individuals per transect, n=12) of all arthropods sampled by this method at the other potato field in Southern Sweden (SE01) were phytophagous (Figure 12 and Figure 13). The portion of phytophagous arthropods in Northern Sweden was lowest with 7% (8.42 ± 7.75 individuals per transect, n=12; Figure 12 and Figure 13).

The abundance of phytophagous arthropods in the vicinity of the potato fields in Germany (DE01: 125.83 ± 34.53 individuals per transect, n=6) and Sweden (SE02: 12.33 ± 8.12 individuals per transect; SE03: 13.50 ± 7.50 individuals per transect, n=6) was strongly higher compared with the abundance of phytophagous arthropods within these potato fields (DE01: 60.33 ± 30.45 individuals per transect; SE02: 5.17 ± 3.31 individuals per transect; SE03: 3.33 ± 3.72 individuals per transect, n=6; Figure 12). In contrast, the abundance of

phytophagous arthropods of one of the potato fields in Southern Sweden (SE01) was similar in transects within the potato field (95.50 ± 41.81 individuals per transect, n=6) and in the vicinity (94.33 ± 51.80 individuals per transect, n=6; Figure 12).

For details on the abundance of arthropods sampled by D-Vac suction sampler, see Appendix 18 to Appendix 21.

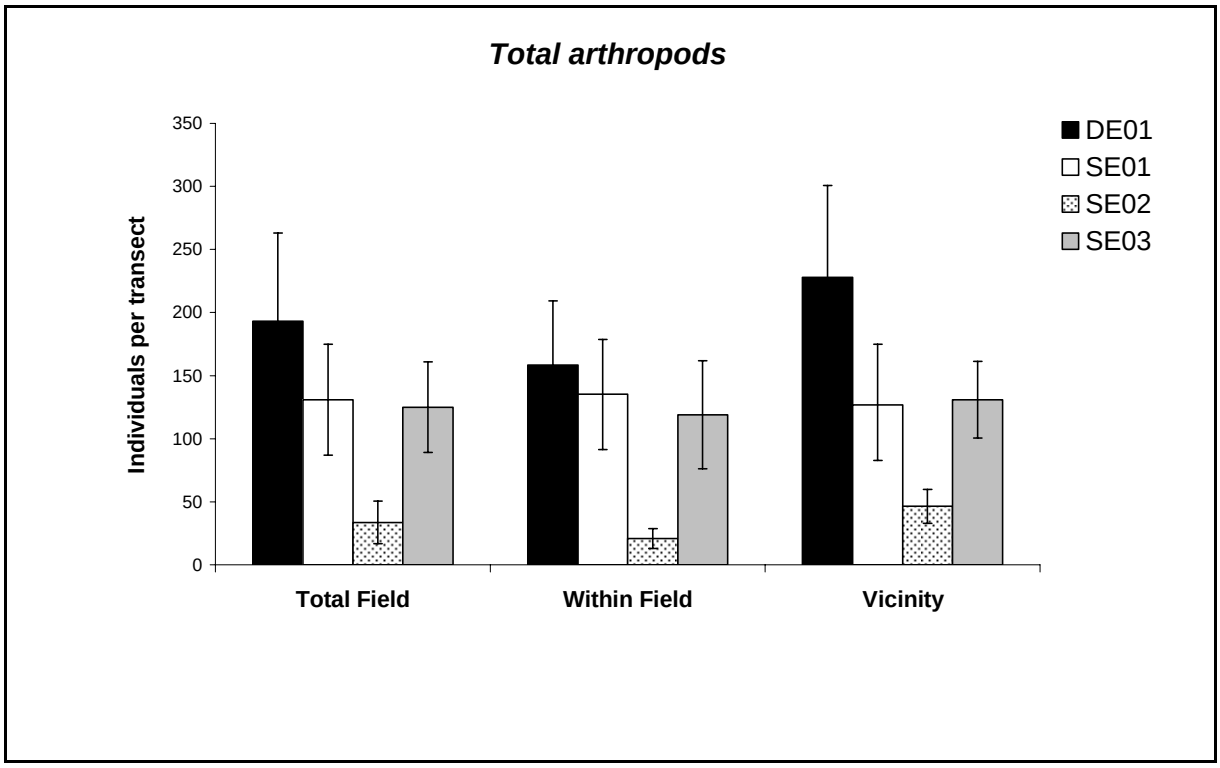


Figure 11: Mean abundance (±SD) of all arthropods from suction sampling within the potato fields and in their vicinity in Germany (DE) and Sweden (SE)

Means over twelve transects for 'Total Field' (n=12), six transects for 'Within Field' (n=6) and six transects for 'Vicinity' (n=6). Ten plants were sampled per transect.

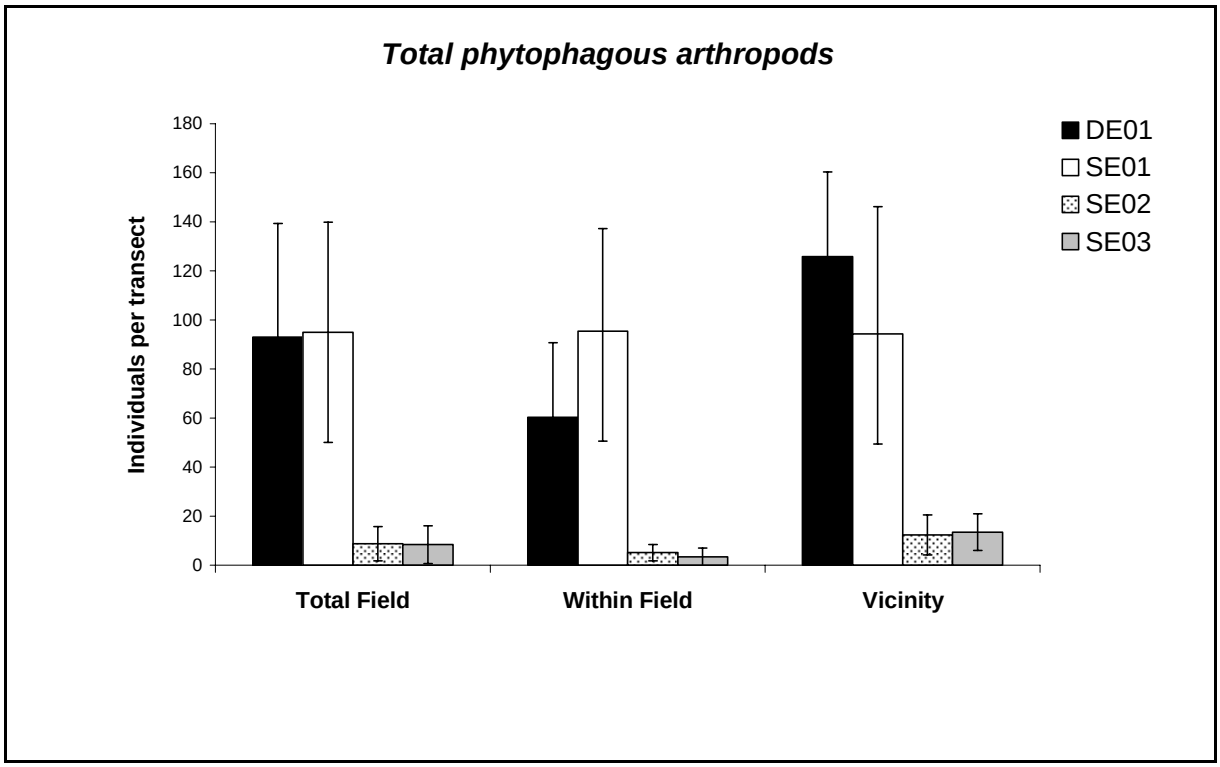


Figure 12: Mean abundance (±SD) of all phytophagous arthropods from suction sampling within the potato fields and in their vicinity in Germany (DE) and Sweden (SE)

Means over twelve transects for 'Total Field' (n=12), six transects for 'Within Field' (n=6) and six transects for 'Vicinity' (n=6). Ten plants were sampled per transect.

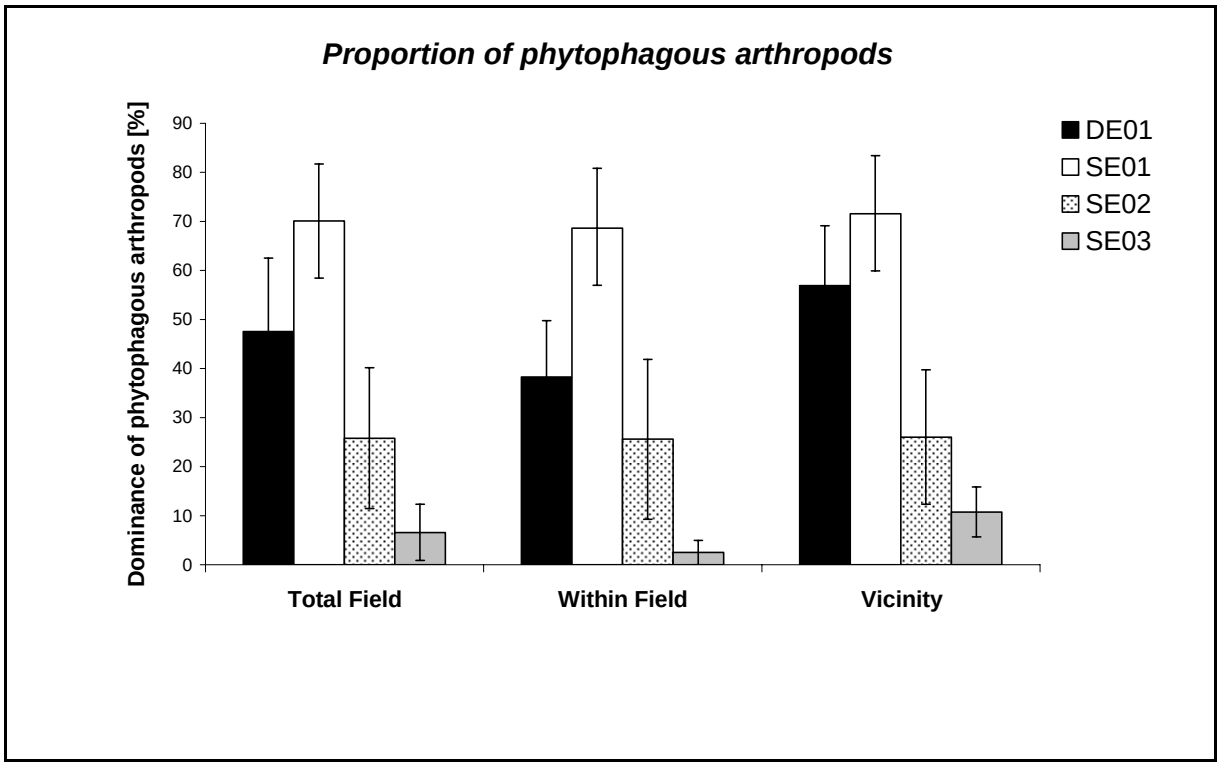


Figure 13: Mean dominance (±SD) of phytophagous arthropods from suction sampling within the potato fields and in their vicinity in Germany (DE) and Sweden (SE)

Means over twelve transects for 'Total Field' (n=12), six transects for 'Within Field' (n=6) and six transects for 'Vicinity' (n=6). Ten plants were sampled per transect.

6.2.1 Abundance of aphids (suction sampling)

The abundance of aphids sampled by suction sampling ranged from 2.42 ± 2.35 individuals per transect (SE03) to 85.42 ± 44.67 individuals per transect (SE01) (n=12; Figure 14). In contrast to the hand sorting method (see above) aphids were found also at the potato field in Northern Sweden (SE03: 2.42 ± 2.35 individuals per transect, n=12; Figure 14).

Furthermore, the aphid abundance within the German potato field (DE01) was lower compared to the vicinity with 7.00 ± 7.80 and 25.00 ± 7.10 individuals per transect (n=6), respectively (Figure 14). Also the abundance of aphids sampled by suction sampling of the Swedish potato fields (SE02 and SE03) was higher in the vicinity of the potato fields (SE02: 5.50 ± 6.16 individuals per transect; SE03: 3.50 ± 2.43 individuals per transect, n=6) than within the potato fields (SE02: 1.33 ± 1.21 individuals per transect; SE03: 1.33 ± 1.86 individuals per transect, n=6; Figure 14). However, these differences are not significant, due to the high variance between the single transects (standard deviation).

For details on the abundance of aphids sampled by D-Vac suction sampler, see Appendix 18 to Appendix 21.

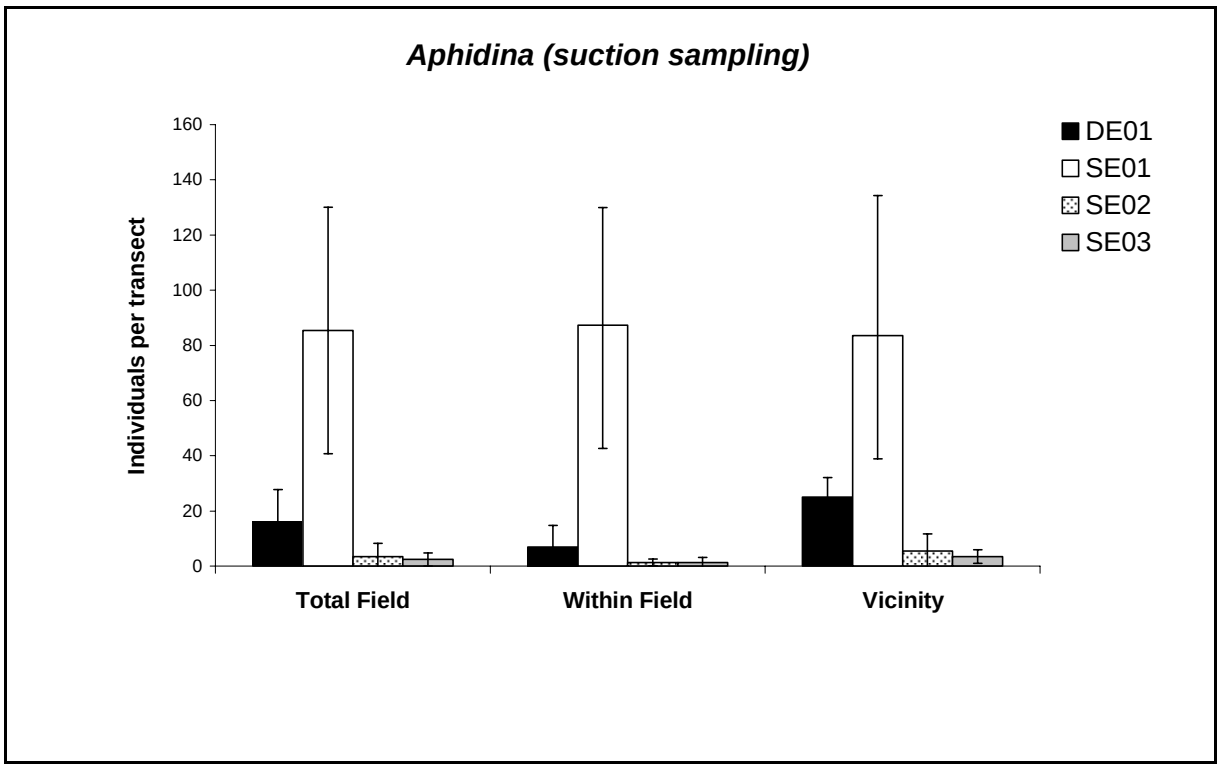


Figure 14: Mean abundance (±SD) of Aphididae from suction sampling within the potato fields and in their vicinity in Germany (DE) and Sweden (SE)

Means over twelve transects for 'Total Field' (n=12), eight transects for 'Within Field' (n=6) and two transects for 'Vicinity' (n=6). Ten plants were sampled per transect.

6.2.2 Abundance of Thysanoptera (suction sampling)

The abundance of Thysanoptera sampled by suction sampling was highest at the German potato field (DE01) with 71.50 ± 32.21 individuals per transect (n=12; Figure 15). In contrast the abundance of Thysanoptera was very low at the Swedish potato fields SE01, SE02 and SE03 with 6.83 ± 4.51, 4.58 ± 5.25 and 3.83 ± 4.17 individuals per transect (n=12), respectively (Figure 15).

Furthermore, the Thysanoptera abundance within the German potato field (DE01) was lower compared with the vicinity with 48.80 ± 16.70 and 94.20 ± 27.80 individuals per transect (n=6), respectively (Figure 14). Also the abundance of Thysanoptera sampled by suction sampling of the Swedish potato field SE03 was higher in the vicinity of the potato fields (6.50 ± 4.32 individuals per transect) than within the potato fields (1.17 ± 1.60 individuals per transect, n=6; Figure 15). However, these differences are not significant, due to the high variance between the single transects (standard deviation).

For details on the abundance of Thysanoptera sampled by D-Vac suction sampler, see Appendix 18 to Appendix 21.

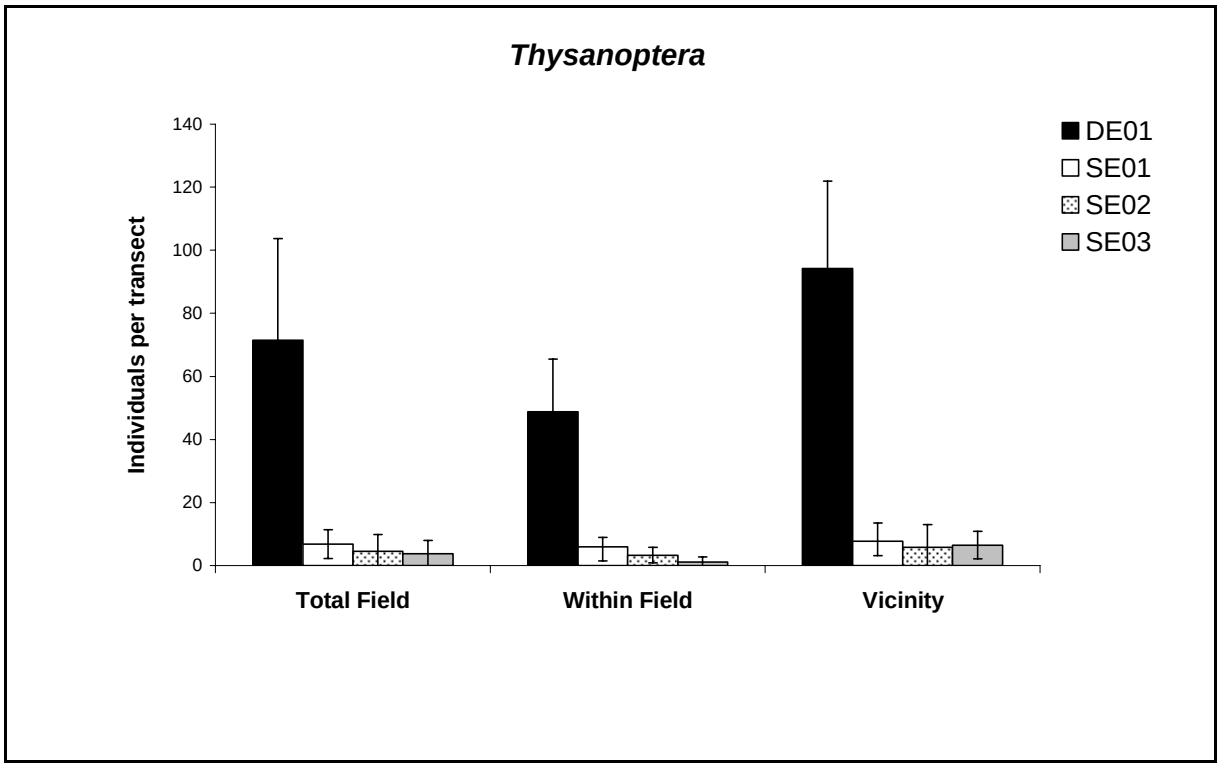


Figure 15: Mean abundance (±SD) of Thysanoptera from suction sampling within the potato fields and in their vicinity in Germany (DE) and Sweden (SE)

Means over twelve transects for 'Total Field' (n=12), six transects for 'Within Field' (n=6) and six transects for 'Vicinity' (n=6). Ten plants were sampled per transect.

6.2.3 Abundance of Miridae (suction sampling)

The total abundance of Miridae in suction samples was very low at all study sites (Figure 16). However, the abundance of Miridae sampled by suction sampling was highest at one of the potato fields in Southern Sweden (SE01) with 1.25 ± 1.36 individuals per transect (n=12; Figure 16). In contrast, the abundance of Miridae was very low at the second potato field in Southern Sweden (SE02) with 0.08 ± 0.29 individuals per transect (n=12), respectively (Figure 16).

Due to the low density of Miridae and the high variation between transects a comparison between transects within the potato fields and in the vicinity of the potato fields is not recommendable.

For details on the abundance of Miridae sampled by D-Vac suction sampler, see Appendix 18 to Appendix 21.

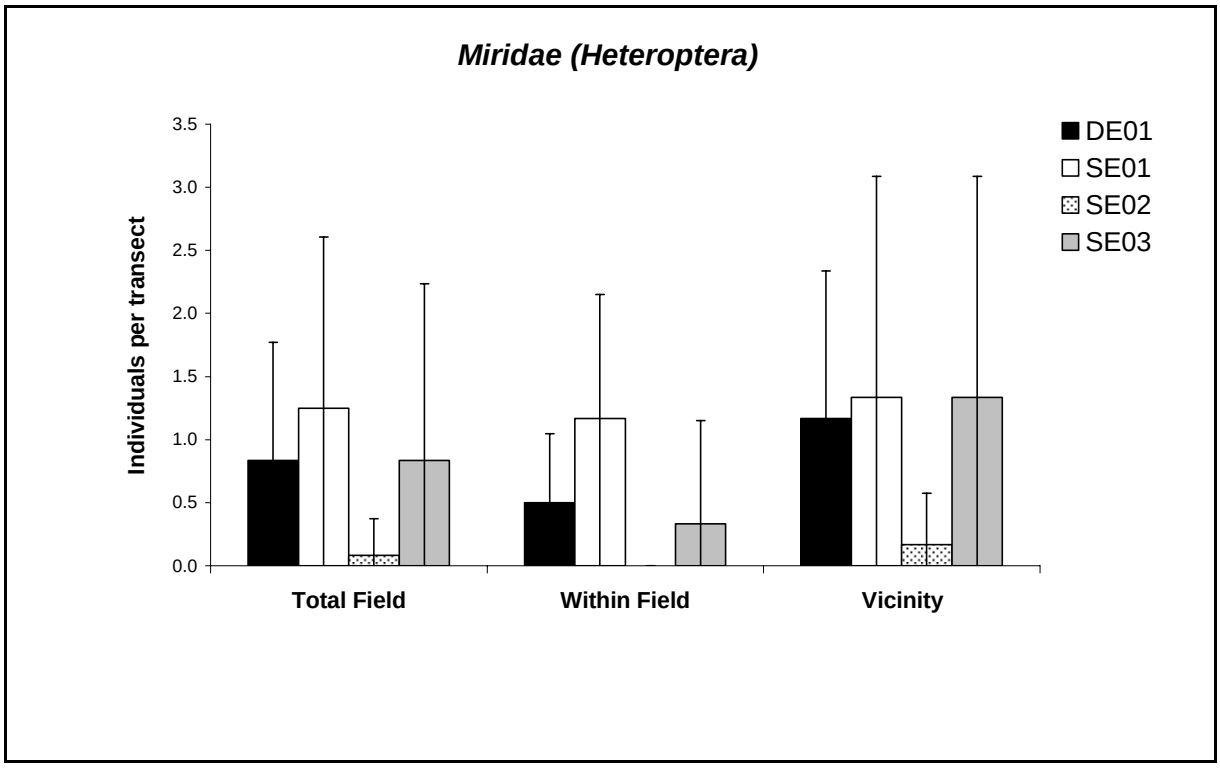


Figure 16: Mean abundance (±SD) of Miridae from suction sampling within the potato fields and in their vicinity in Germany (DE) and Sweden (SE)

Means over twelve transects for 'Total Field' (n=12), six transects for 'Within Field' (n=6) and six transects for 'Vicinity' (n=6). Ten plants were sampled per transect.

6.2.4 Abundance of Heteroptera (without Miridae; suction sampling)

Heteroptera (without Miridae) were only sampled with suction sampling at the potato field in Germany (DE01) and at one of two potato fields in Southern Sweden (SE01). At these study sites the abundance of Heteroptera (without Miridae) was very low (DE01: 2.17 ± 2.21 individuals per transect and SE01: 0.08 ± 0.29 individuals per transect, n=12; Figure 17).

The abundance of Heteroptera (without Miridae) within the German potato field (DE01) was lower compared with the vicinity with 0.83 ± 0.75 and 3.50 ± 2.43 individuals per transect

(n=6), respectively (Figure 17). However, these differences are not significant, due to the high variance between the single transects (standard deviation).

Due to the low density of Heteroptera (without Miridae) and the high variation between transects a comparison between transects within the potato field SE01 and in the vicinity of the potato field SE01 is not recommendable.

For details on the abundance of Heteroptera (without Miridae) sampled by D-Vac suction sampler, see Appendix 18 to Appendix 21.

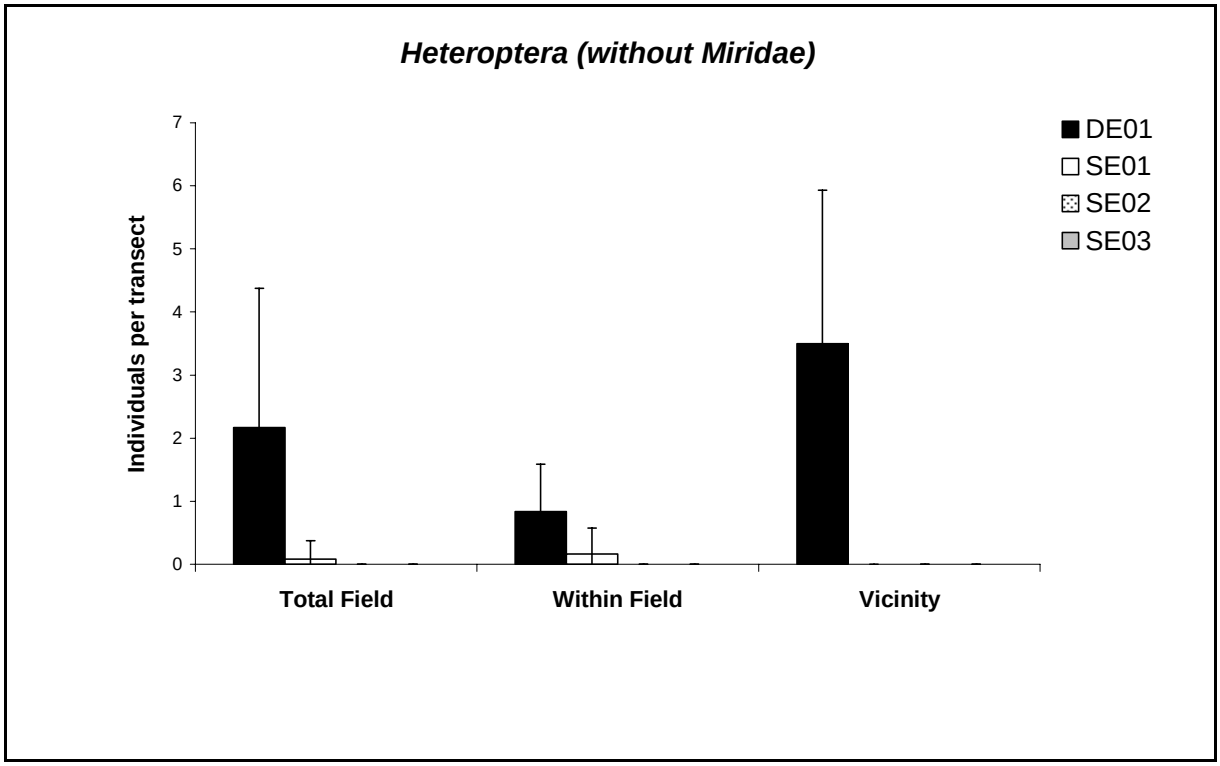


Figure 17: Mean abundance (±SD) of Heteroptera (without Miridae) from suction sampling within the potato fields and in their vicinity in Germany (DE) and Sweden (SE)

Means over twelve transects for 'Total Field' (n=12), six transects for 'Within Field' (n=6) and six transects for 'Vicinity' (n=6). Ten plants were sampled per transect.

6.2.5 Abundance of Auchenorrhyncha (suction sampling)

The total abundance of Auchenorrhyncha in suction samples was very low at all study sites (Figure 18). However, the abundance of Auchenorrhyncha sampled by suction sampling was highest at the German potato field (DE01) with 0.42 ± 0.90 individuals per transect (n=12; Figure 18). In contrast, no Auchenorrhyncha were found at the second potato field in Sweden (SE02; Figure 18).

Due to the low density of Auchenorrhyncha and the high variation between transects a comparison between transects within the potato fields and in the vicinity of the potato fields is not recommendable.

For details on the abundance of Auchenorrhyncha sampled by D-Vac suction sampler, see Appendix 18 to Appendix 21.

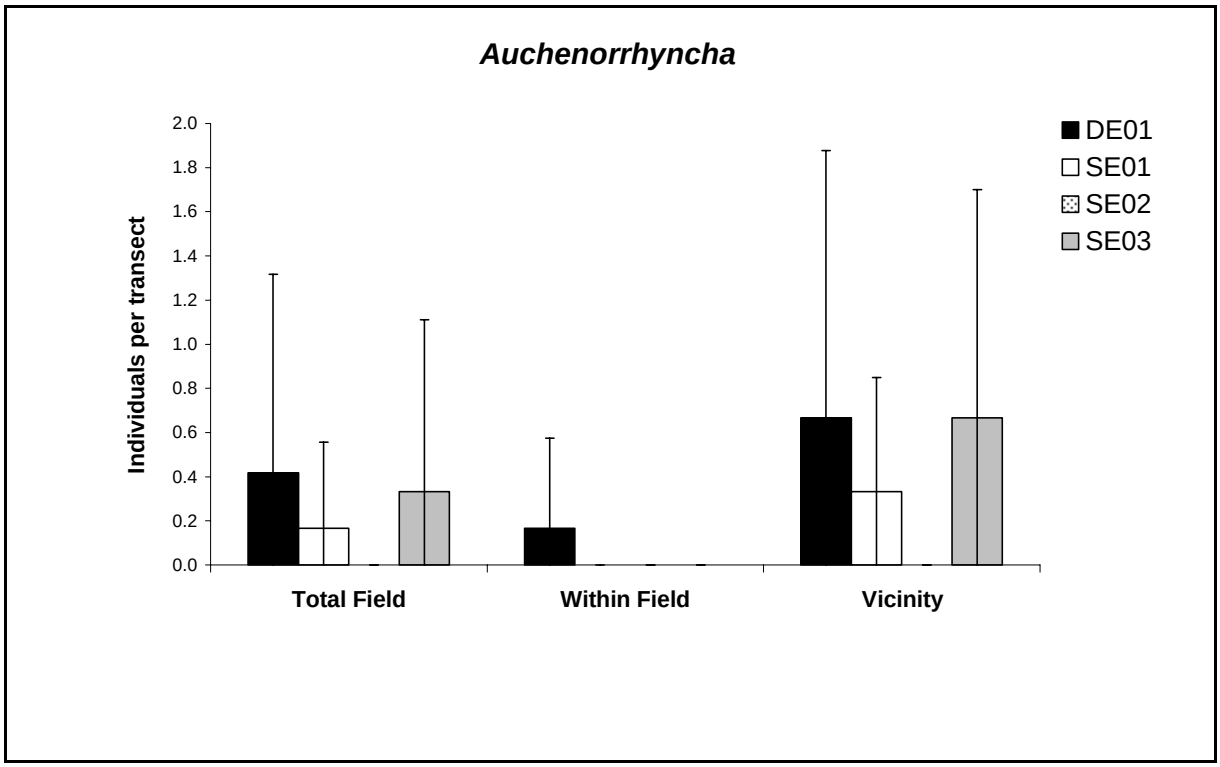


Figure 18: Mean abundance (±SD) of Auchenorrhyncha from suction sampling within the potato fields and in their vicinity in Germany (DE) and Sweden (SE)

Means over twelve transects for 'Total Field' (n=12), six transects for 'Within Field' (n=6) and six transects for 'Vicinity' (n=6). Ten plants were sampled per transect.

6.2.6 Abundance of Psyllina (suction sampling)

The total abundance of Psyllina in suction samples was very low at all study sites (Figure 18). However, the abundance of Psyllina sampled by suction sampling was highest at the Swedish potato field (SE02) with 0.50 ± 0.80 individuals per transect (n=12; Figure 18). The lowest abundance of Psyllina was found at the potato fields in Germany (DE01) and Northern Sweden (SE03) with 0.17 ± 0.39 individuals per transect (n=12), respectively (Figure 19).

Due to the low density of Psyllina and the high variation between transects a comparison between transects within the potato fields and in the vicinity of the potato fields is not recommendable.

For details on the abundance of Psyllina sampled by D-Vac suction sampler, see Appendix 18 to Appendix 21.

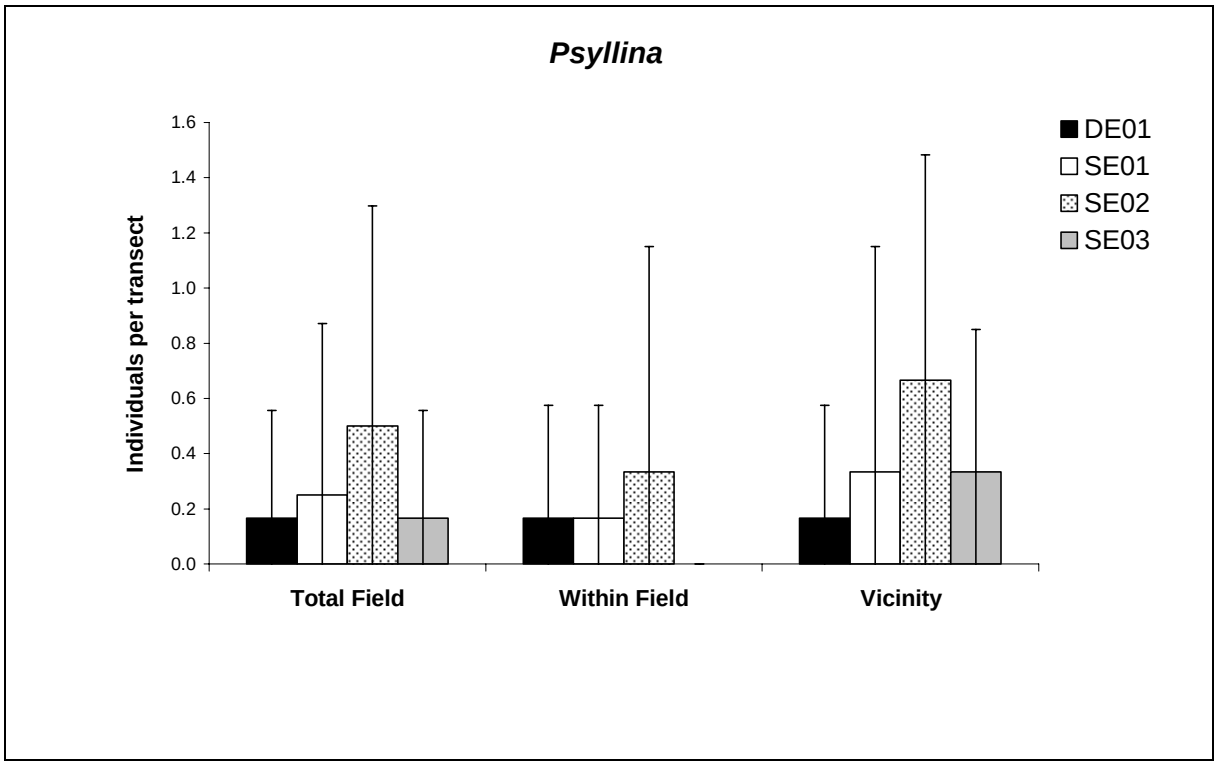


Figure 19: Mean abundance (±SD) of Psyllina from suction sampling within the potato fields and in their vicinity in Germany (DE) and Sweden (SE)

Means over twelve transects for 'Total Field' (n=12), six transects for 'Within Field' (n=6) and six transects for 'Vicinity' (n=6). Ten plants were sampled per transect.

6.2.7 Abundance of Coleoptera (phytophagous beetles; suction sampling)

The total abundance of phytophagous beetles in suction samples was very low at all study sites (Figure 20). However, the abundance of phytophagous beetles sampled by suction sampling was highest at the German potato field (DE01) with 0.25 ± 0.45 individuals per transect (n=12; Figure 20). In contrast, no phytophagous beetles were found at one potato field in Sweden (SE02; Figure 20).

No phytophagous beetle was found within the potato fields at any of the study sites (Figure 18). However, due to the very low densities of phytophagous beetles in the vicinity of the

study fields and the high variation between transects these differences in abundances are not significant.

For details on the abundance of phytophagous beetles sampled by D-Vac suction sampler, see Appendix 18 to Appendix 21.

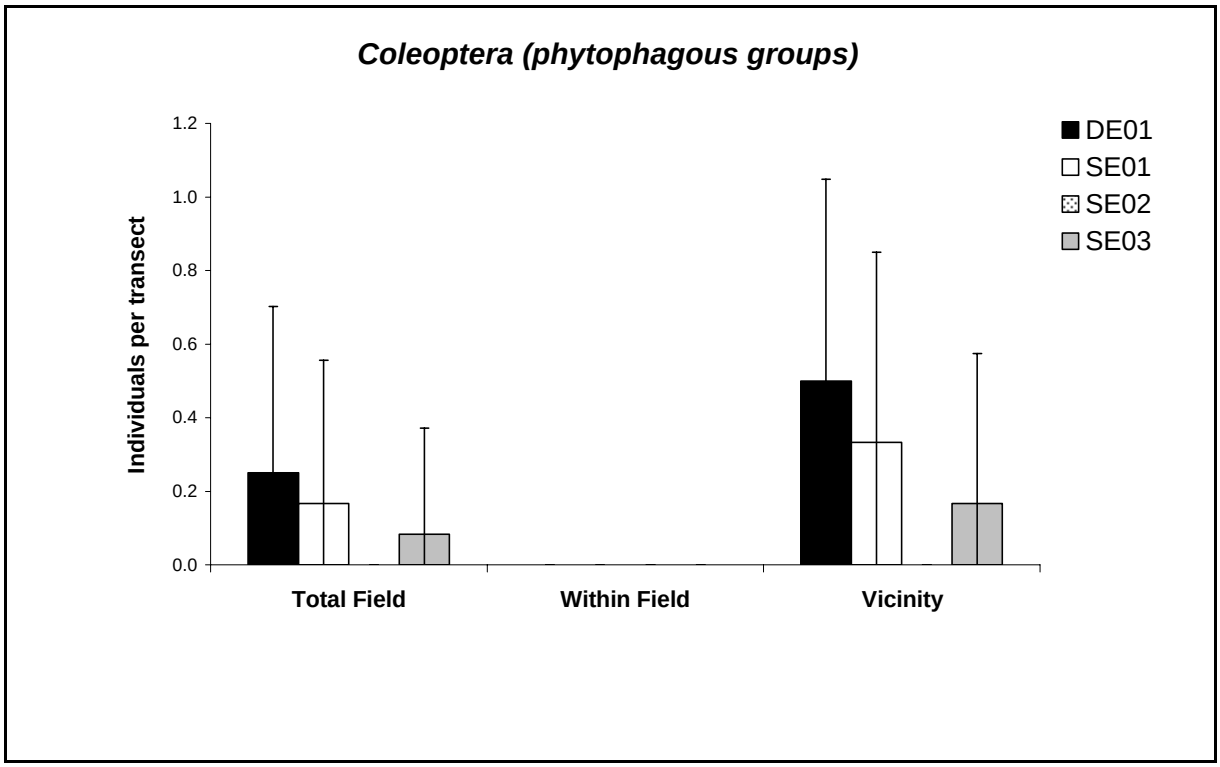


Figure 20: Mean abundance (±SD) of phytophagous beetles from suction sampling within the potato fields and in their vicinity in Germany (DE) and Sweden (SE)

Means over twelve transects for 'Total Field' (n=12), six transects for 'Within Field' (n=6) and six transects for 'Vicinity' (n=6). Ten plants were sampled per transect.

6.2.8 Abundance of Collembola (suction sampling)

The total abundance of Collembola in suction samples was very low at all study sites (Figure 21). However, the abundance of phytophagous beetles sampled by suction sampling was highest at the potato field in Northern Sweden (SE03) with 0.67 ± 0.89 individuals per transect (n=12; Figure 21). In contrast, no Collembola were found at the potato field in Germany and at one of the potato fields in Southern Sweden (SE02; Figure 21).

Due to the low density of Collembola and the high variation between transects a comparison between transects within the potato fields and in the vicinity of the potato fields is not recommendable.

For details on the abundance of Collembola sampled by D-Vac suction sampler, see Appendix 18 to Appendix 21.

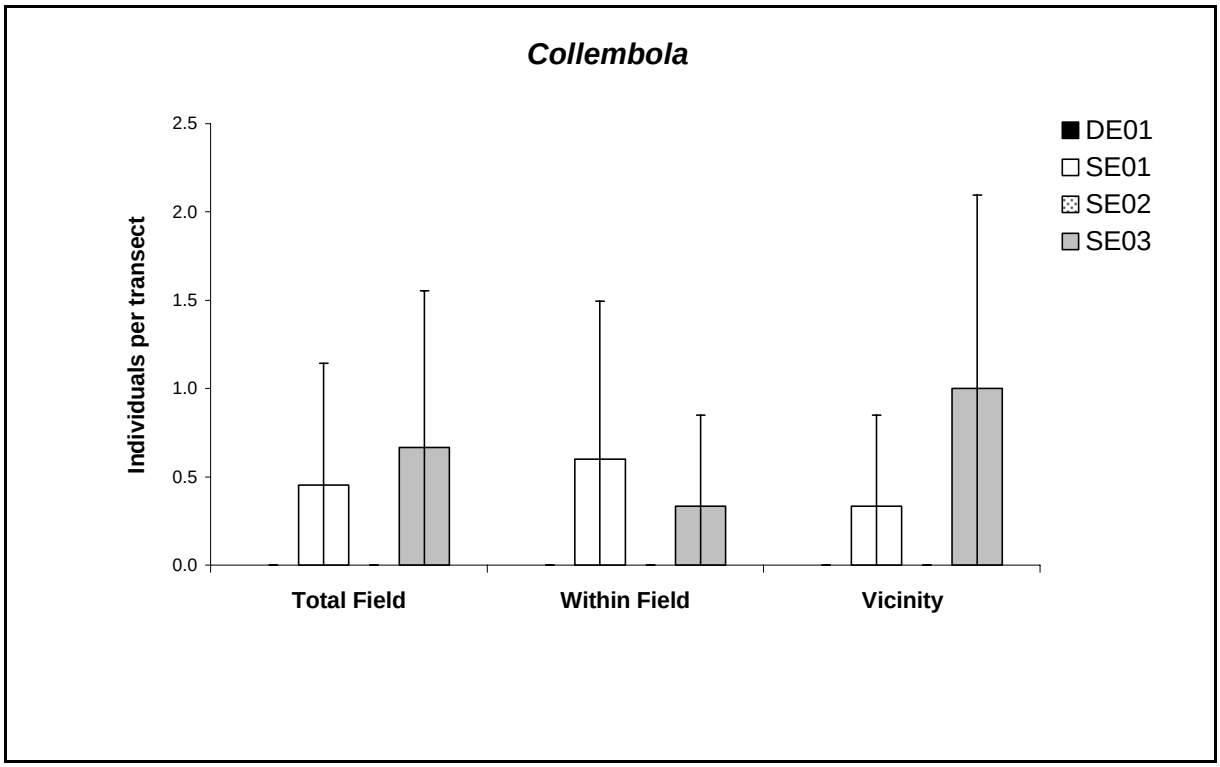


Figure 21: Mean abundance (±SD) of Collembola from suction sampling within the potato fields and in their vicinity in Germany (DE) and Sweden (SE)

Means over twelve transects for 'Total Field' (n=12), six transects for 'Within Field' (n=6) and six transects for 'Vicinity' (n=6). Ten plants were sampled per transect.

6.3 Abundance of other arthropods (suction sampling)

6.3.1 Abundance of Coccinellidae (suction sampling)

No Coccinellidae were found at the potato field in Germany and the three potato fields in Sweden (DE01, SE01, SE02 and SE03).

6.3.2 Abundance of Neuroptera (suction sampling)

The total abundance of Neuroptera in suction samples was very low at all study sites (Figure 22). However, the abundance of Neuroptera sampled by suction sampling was highest at the German potato field (DE01) with 2.00 ± 1.60 individuals per transect (n=12; Figure 22). In contrast, no Neuroptera were found at one potato field in Sweden (SE02; Figure 22).

The abundance of Neuroptera was similar within the potato fields DE01 and SE03 compared with the vicinity of the potato fields, respectively (Figure 22). In contrast, Neuroptera were found only in the vicinity of potato field SE01 (0.17 ± 0.41 individuals per transect, n=6) and not within this potato field (Figure 22). However, due to the very low densities of Neuroptera in the vicinity of the study field and the high variation between transects differences in abundances are not significant.

For details on the abundance of Neuroptera sampled by D-Vac suction sampler, see Appendix 18 to Appendix 21.

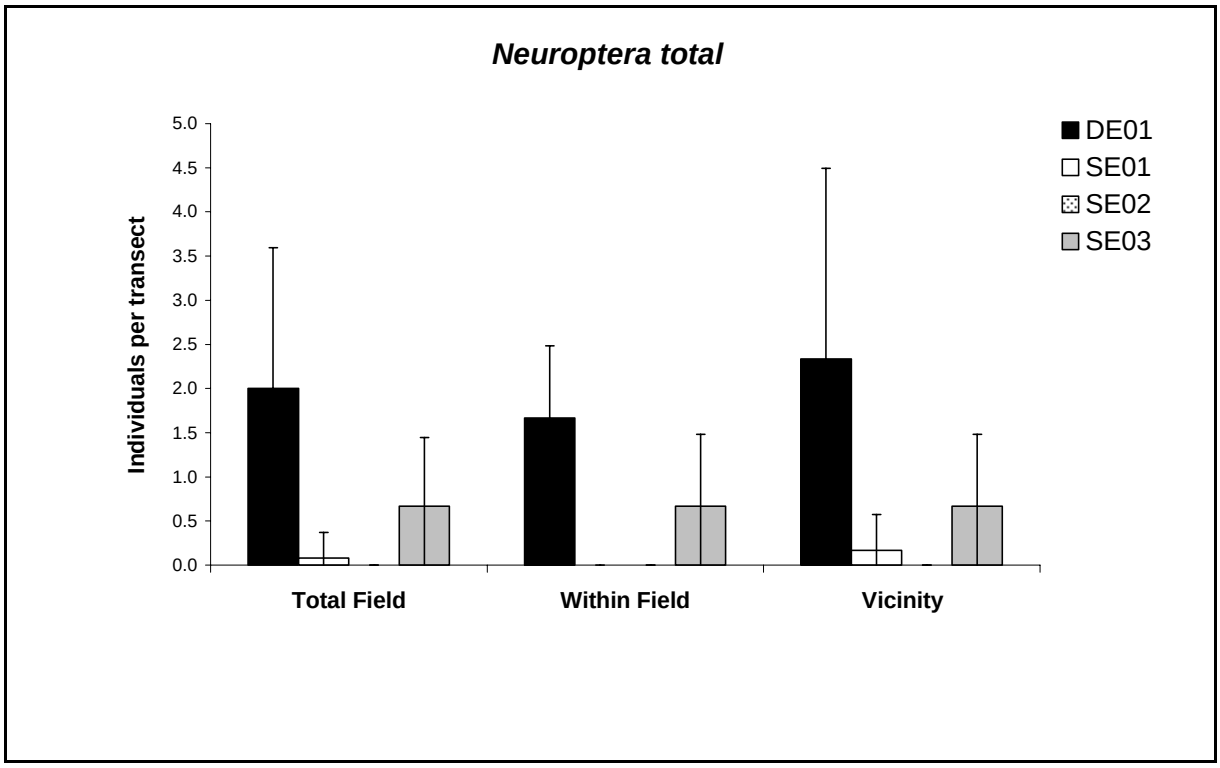


Figure 22: Mean abundance (±SD) of Neuroptera from suction sampling within the potato fields and in their vicinity in Germany (DE) and Sweden (SE)

Means over twelve transects for 'Total Field' (n=12), six transects for 'Within Field' (n=6) and six transects for 'Vicinity' (n=6). Ten plants were sampled per transect.

6.3.3 Abundance of Hymenoptera (without Formicidae; suction sampling)

The abundance of Hymenoptera (without Formicidae) sampled by suction sampling was highest at the German potato field (DE01) with 27.00 ± 16.43 individuals per transect (n=12; Figure 23). In contrast the abundance of Hymenoptera (without Formicidae) was lowest at the Swedish potato fields SE03 with 7.17 ± 5.24 individuals per transect (n=12), respectively (Figure 23).

Furthermore, the abundance of Hymenoptera (without Formicidae) within the German potato field (DE01) was lower compared with the vicinity with 16.67 ± 4.68 and 37.33 ± 17.76 individuals per transect (n=6), respectively (Figure 23). Also the abundance of Hymenoptera (without Formicidae) sampled by suction sampling of the Swedish potato field SE02 was higher in the vicinity of the potato fields (20.33 ± 7.20 individuals per transect) than within the potato fields (11.17 ± 4.79 individuals per transect, n=6; Figure 23). In contrast, the abundance of Hymenoptera (without Formicidae) within the Swedish potato field SE01 was higher (24.83 ± 9.95 individuals per transect) compared with the abundance in the vicinity of the potato field (20.67 ± 7.34 individuals per transect, n=6; Figure 23). However, these differences are not significant, due to the high variance between the single transects (standard deviation).

For details on the abundance of Hymenoptera (without Formicidae) sampled by D-Vac suction sampler, see Appendix 18 to Appendix 21.

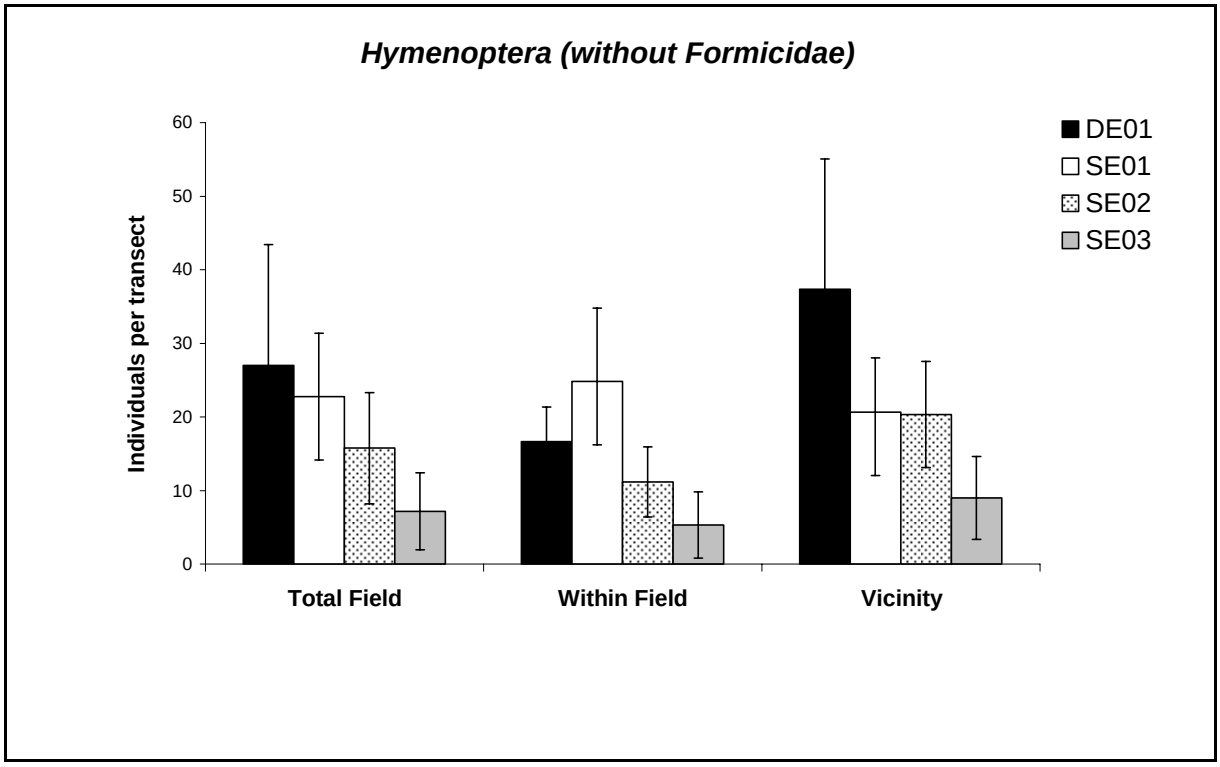


Figure 23: Mean abundance (±SD) of Heteroptera from suction sampling within the potato fields and in their vicinity in Germany (DE) and Sweden (SE)

Means over twelve transects for 'Total Field' (n=12), six transects for 'Within Field' (n=6) and six transects for 'Vicinity' (n=6). Ten plants were sampled per transect.

6.4 Weather data

6.4.1 Precipitation (Non-GLP)

A total of 14 rainy days were recorded during July 2011 with a total precipitation of 84.3 mm at the study site in Germany (Figure 24 and Appendix 11). For the sampling day (12.07.2011) 1.1 mm precipitation was recorded, but it was not rainy during sampling at the study site in Germany.

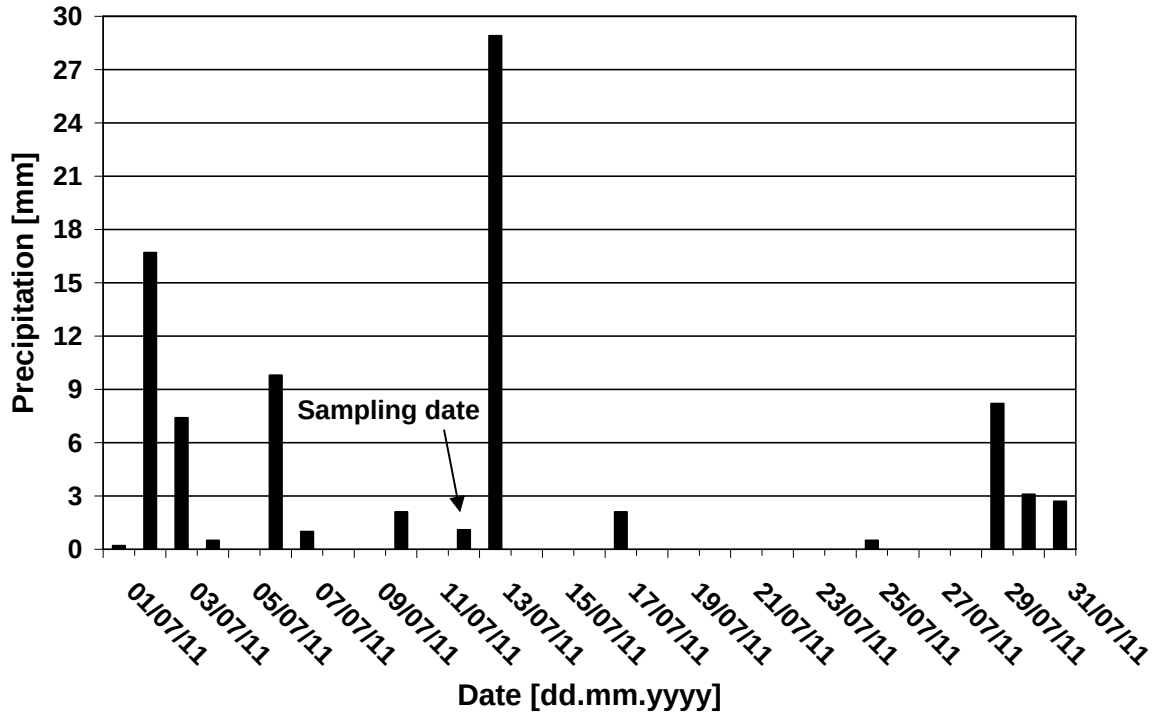


Figure 24: Daily precipitation for July 2011 at the study site in Germany

Data obtained from the nearest weather recording station in Barneberg (GPS data, UTM, WGS 84: 32 U 642372 5776080); Source: Deutscher Wetterdienst (http://premium.dwd.de/weste/xl_1.jsp). Recordings measured from 01 July to 31 July 2011.

During July 2011 a total precipitation of 59.8 mm occurred on 14 rainy days at the study site in North Sweden (measured for Vojakkala; Figure 25 and Appendix 12). In August 2011 a total precipitation of 67.8 mm occurred on 19 rainy days (Figure 26 and Appendix 13). However, no rain was measured on the sampling day (01.08.2011) at this study site.

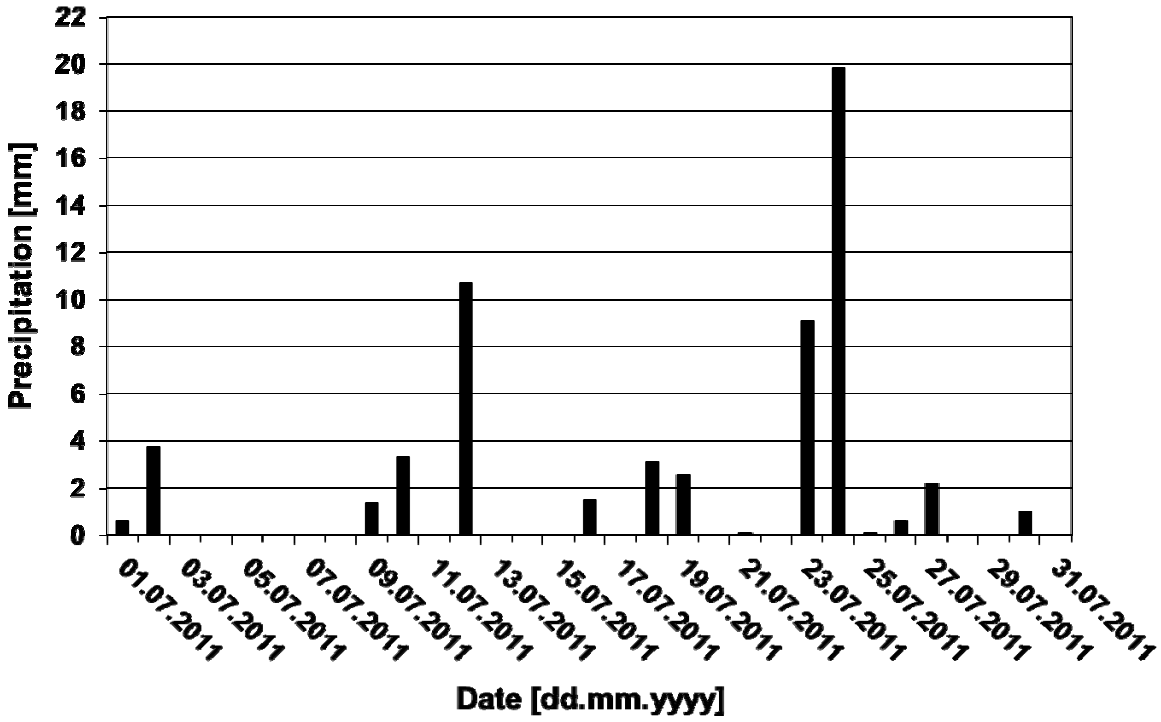


Figure 25: Daily precipitation for July 2011 at the study site in Northern Sweden

Data obtained from the nearest weather recording station in Vojakkala; Source: www.klart.se. Recordings measured from 01 July to 31 July 2011.

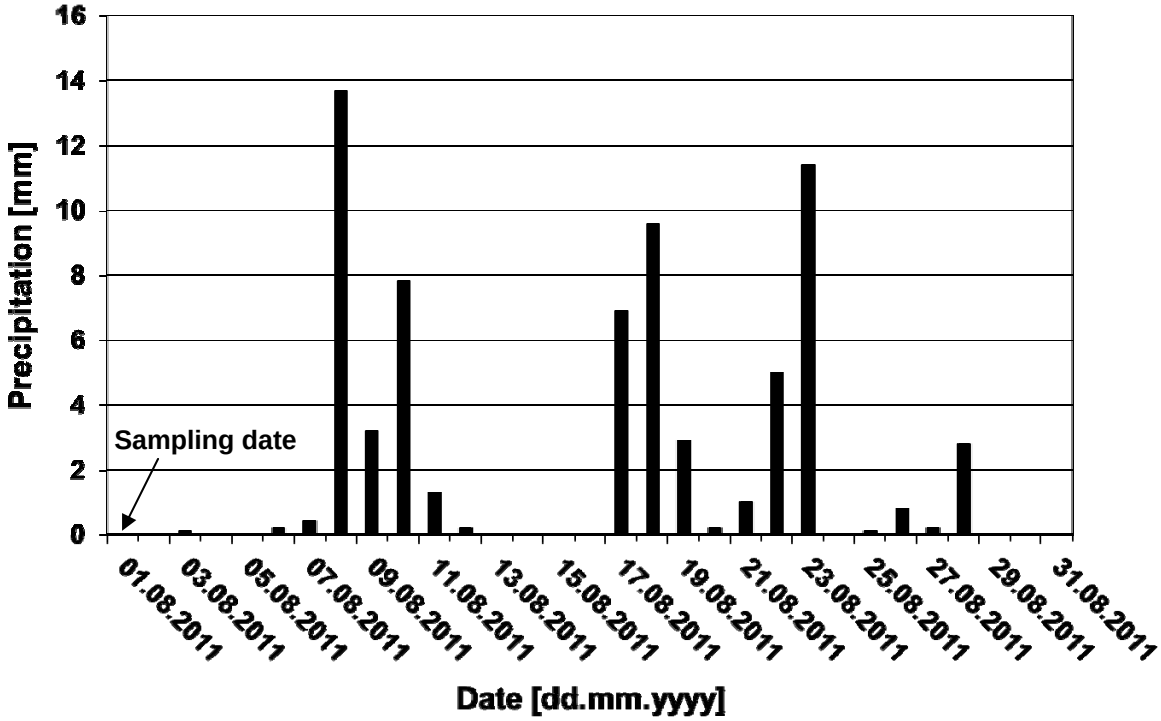


Figure 26: Daily precipitation for August 2011 at the study site in Northern Sweden

Data obtained from the nearest weather recording station in Vojakkala; Source: www.klart.se. Recordings measured from 01 August to 31 August 2011.

A total of 27 rainy days were recorded during July 2011 with a total precipitation of 128.1 mm at the study site in Southern Sweden (Figure 27 and Appendix 12). However, no rain was measured on the sampling day (13.07.2011) at this study site.

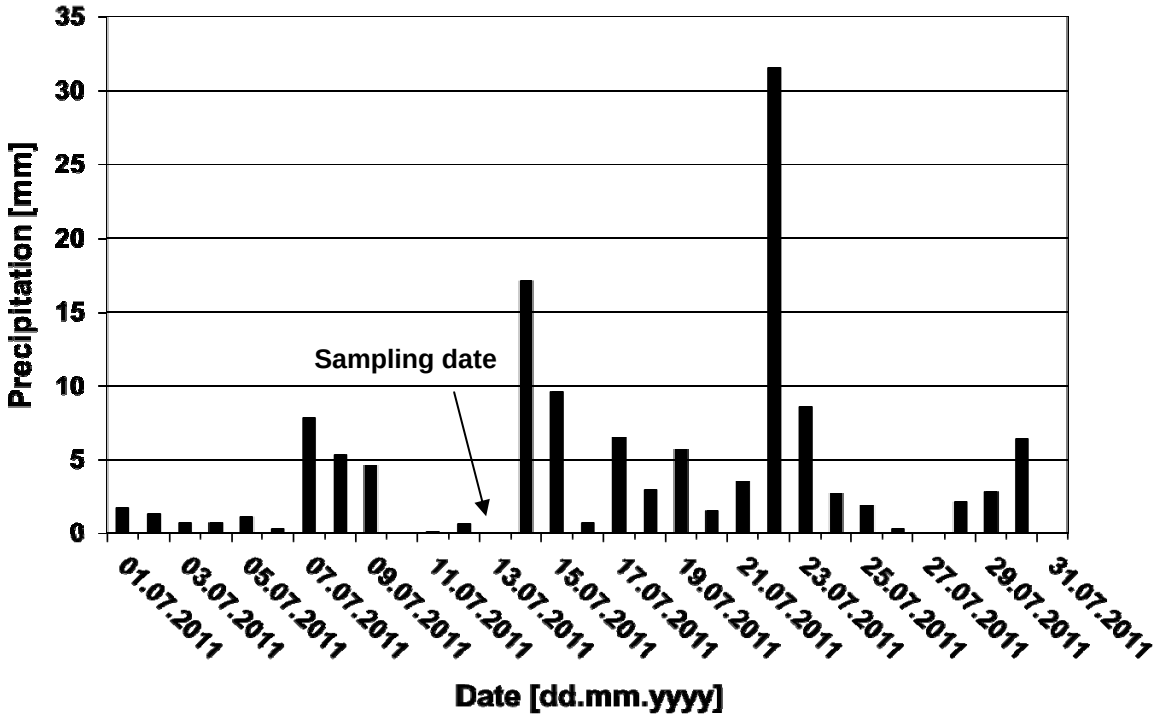


Figure 27: Daily precipitation for July 2011 at the study sites in Southern Sweden

Data obtained from the nearest weather recording station in Vinninga; Source: www.klart.se. Recordings measured from 01 July to 31 July 2011.

6.4.2 Temperature (Non-GLP)

Temperature data recorded for Ummendorf (located approx. 8 km from the potato field DE01) ranged between a minimum of 8.3°C and a maximum of 28.2°C during July 2011 (Appendix 11). A mean temperature of 16.4°C was measured for July 2011. On the sampling day (12.07.2011) a mean temperature of 20.0 °C was recorded.

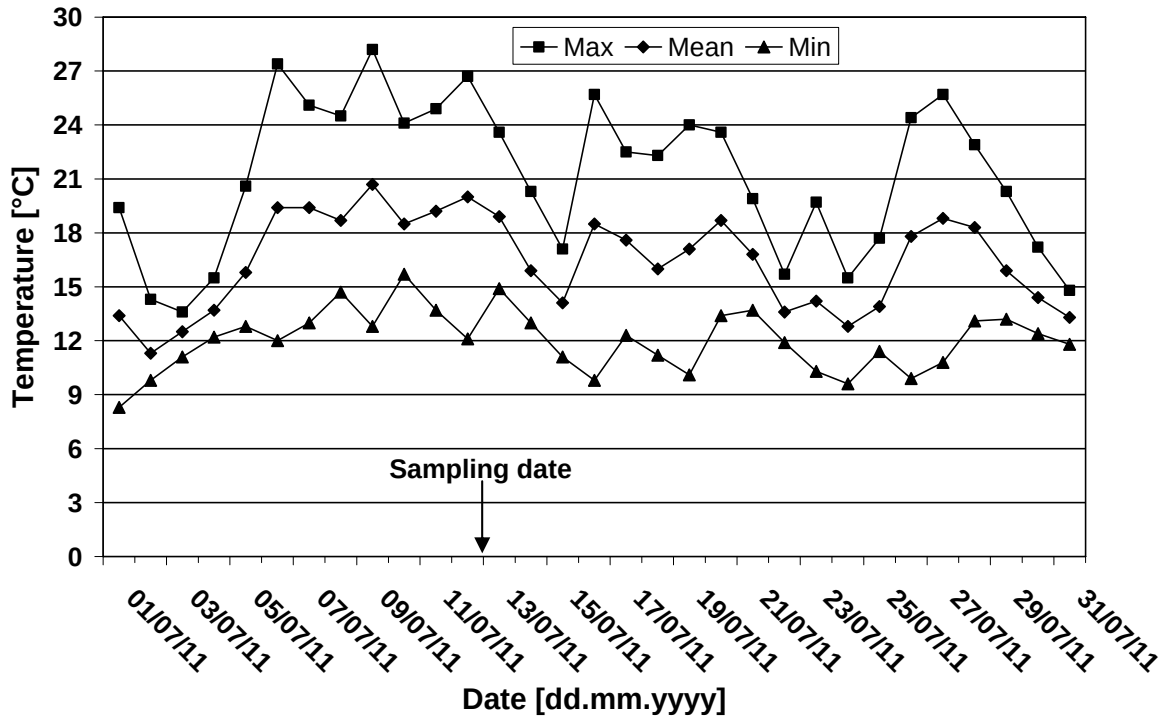


Figure 28: Daily temperature data for July 2011 at the study site in Germany

Data obtained from the nearest weather recording station in Ummendorf (GPS data, UTM, WGS 84: 32 U 648884 5781257); Source: Deutscher Wetterdienst (http://premium.dwd.de/weste/xl_1.jsp). Recordings measured from 01 July to 31 July 2011.

A mean temperature of 17.8°C and 13.9°C was measured for July and August 2011 in Northern Sweden (measured for Vojakkala), respectively (Figure 29, Appendix 12 and Appendix 13). On the sampling day (01.08.2011) a mean temperature of 15.5 °C was recorded (Figure 30).

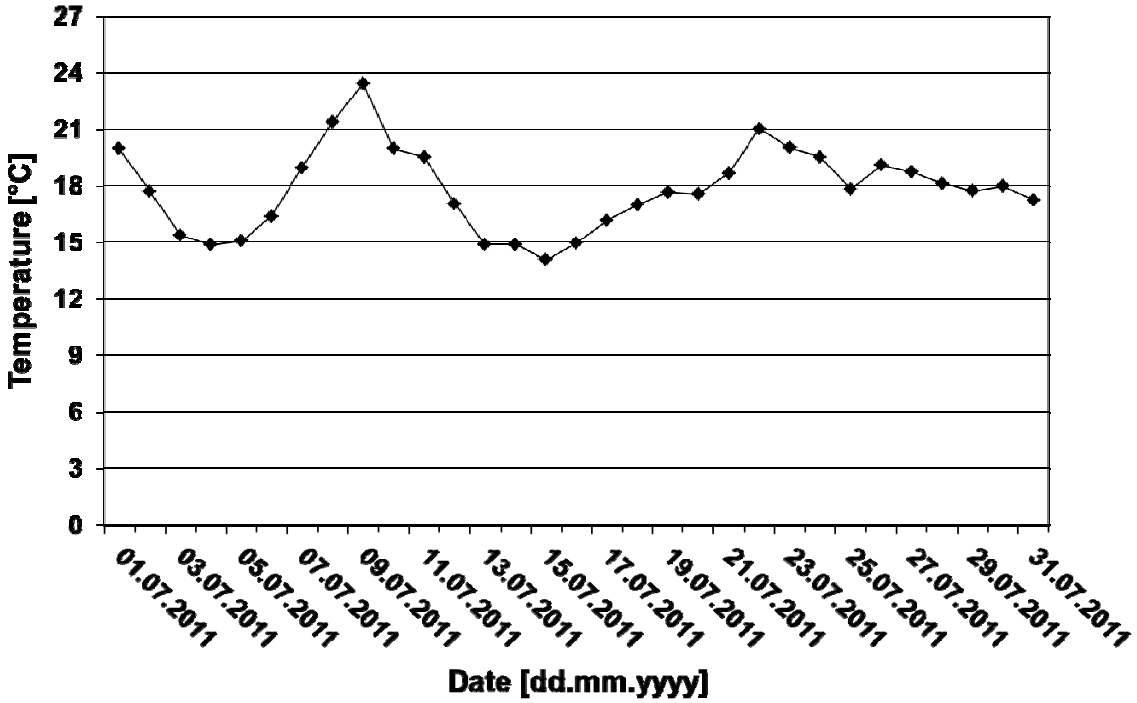


Figure 29: Daily temperature data for July at the study site in Northern Sweden

Data obtained from the nearest weather recording station in Vojakkala; Source: www.klart.se. Recordings measured from 01 July to 31 July 2011.

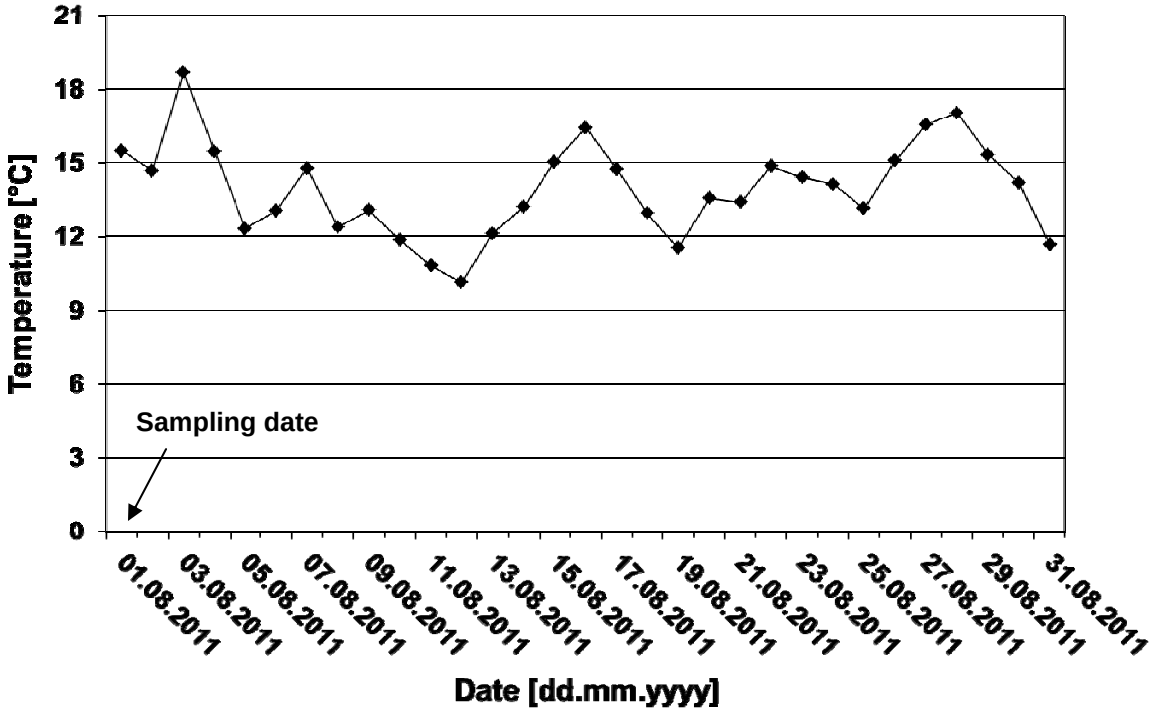


Figure 30: Daily temperature data for August at the study site in Northern Sweden

Data obtained from the nearest weather recording station in Vojakkala; Source: www.klart.se. Recordings measured from 01 August to 31 August 2011.

A mean temperature of 17.4°C was measured for July 2011 in Southern Sweden (measured for Vinninga). On the sampling day (13.07.2011) a mean temperature of 14.8 °C was recorded (Figure 31 and Appendix 12).

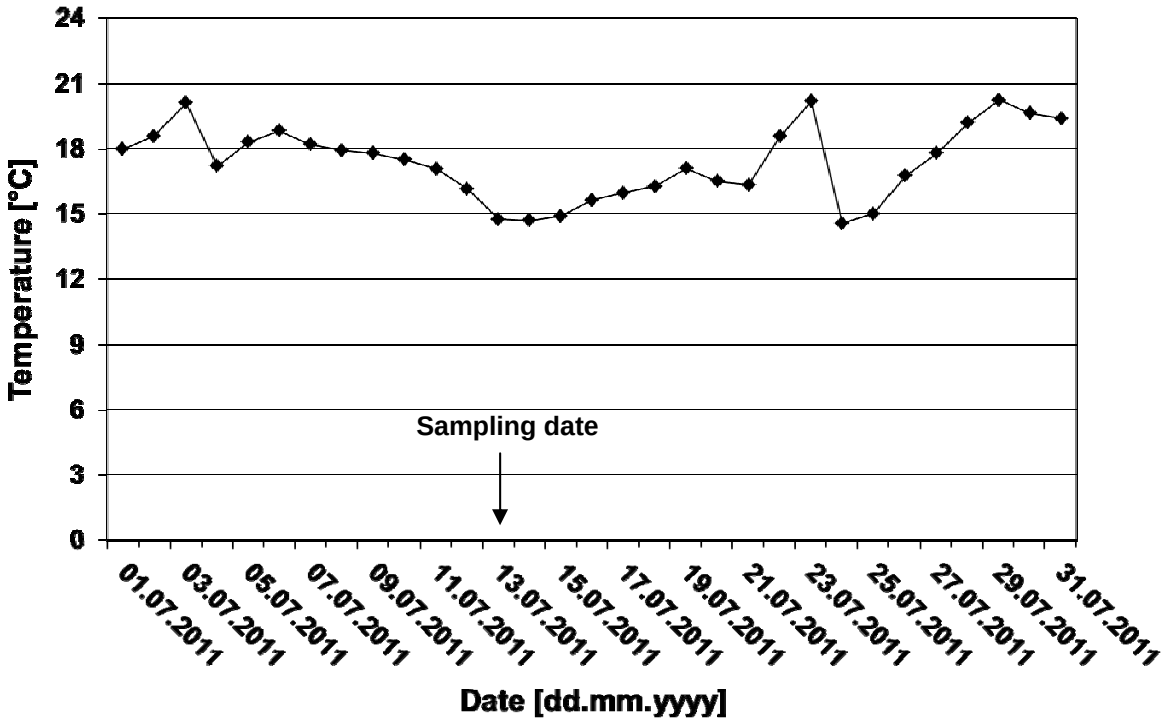


Figure 31: Daily temperature data for July at the study sites in Southern Sweden

Data obtained from the nearest weather recording station in Vinninga; Source: www.klart.se. Recordings measured from 01 July to 31 July 2011.

7 GENERAL DISCUSSION

Phytophagous arthropods were sampled by two different methods (hand sorting, suction sampling) at four commercially cultivated Amflora fields in two different countries (one field in Germany and three fields in Sweden).

The sampling of potato aphids by D-Vac suction was more successful than the sampling by hand sorting according to EPPO Standard PP 1/ 230 (1) 'Aphids on potatoes', if very low abundances of aphids occurred at one region (e.g. Northern Sweden).

Other phytophagous arthropod groups (e.g. Thysanoptera, Miridae, Auchenorrhyncha, Collembola) were also sampled by D-Vac suction. In Germany, approx. half of the arthropods sampled by suction sampling were phytophagous, but less than a quarter were aphids. The proportion of phytophagous arthropods of total arthropods sampled by suction sampling was very high at one potato field in Southern Sweden (SE01) with up to 70%, which were mostly aphids. In contrast, at the other potato field in Southern Sweden (SE02) and in Northern Sweden (SE03) most arthropods caught by suction sampling were not phytophagous. The strong difference between the density of phytophagous arthropods at both potato fields in Southern Sweden (SE01 and SE03) could be explained by the strong difference of aphid abundances between potato fields, which may have been caused by the insecticide treatment two days before sampling (treatment: 11.07.2011; sampling: 13.07.2011).

These results are evidence for the suitability of the D-Vac suction method for monitoring phytophagous arthropods in potato fields. In contrast to other sampling methods like yellow dishes, D-Vac suction sampling not only catches the flying stages of insects, like winged aphids, but also the larval stages, which are also feeding on potato plants.

In this study phytophagous arthropods were sampled along transects within each potato field (n=6) and in the vicinity of each potato field (outer line of the field; n=6). As shown for different phytophagous arthropod groups, abundances were mostly higher in the vicinity of the potato fields than within the potato fields. Furthermore, phytophagous beetles were found only in the vicinity of the potato fields. However, the variation between the single transects of a field was very high and therefore differences between transects within the potato field and in the vicinity of the potato field are not significant.

8 CONCLUSION

The current study provides field data on the abundances of phytophagous arthropods at four Amflora fields in two different countries (Germany and Sweden). The data proved the suitability of the methods (D-Vac suction sampling and hand sorting) used to sample phytophagous arthropods (e.g. potato aphids, Thysanoptera, Heteroptera, Collembola, Auchenorrhyncha).

The abundance of phytophagous arthropods in Amflora potato fields differed strongly between the different commercial potato cultivation areas in Germany and Sweden. The highest abundances were found at potato fields in Germany. The lowest number of individuals was mostly counted at the potato field in Northern Sweden. Furthermore, differences were found between abundances of phytophagous arthropods sampled within the Amflora fields and in the vicinity of the Amflora fields. However, the abundance of

phytophagous arthropods in Amflora potato fields varied strongly between transects and therefore differences are not significant.

9 REFERENCES

Blackman R. L. and Eastop, V. F. (2000): Aphids on the World's Crop – An Identification and Information Guide- 2nd Edition. John Wiley & Sons, LTD, England; pp 1-466.

Brook A. J., Woodcock B. A., Sinka M. and Vanbergen A.J. (2008): Experimental verification of suction sampler capture efficiency in grasslands of differing vegetation height and structure. Journal of Applied Ecology, 45; pp. 1357–1363.

Dubnik, H. (1991): Blattläuse – Artenbestimmung- Biologie- Bekämpfung. Mann, Gelsenkirchen-Buer, Germany.

EPPO (2005): EPPO Standard PP 1/230 (1) Aphids on potatoes. Biologische Bundesanstalt für Land- und Forstwirtschaft, Braunschweig, Germany.

Koss A. M., Jensen A. S, Schreiber A., Pike K. S. and Snyder W. E. (2005): Comparison of Predator and Pest Communities in Washington Potato Fields Treated with Broad-Spectrum, Selective, or Organic Insecticides. Environmental Entomology, 34 (1); pp. 87-95.

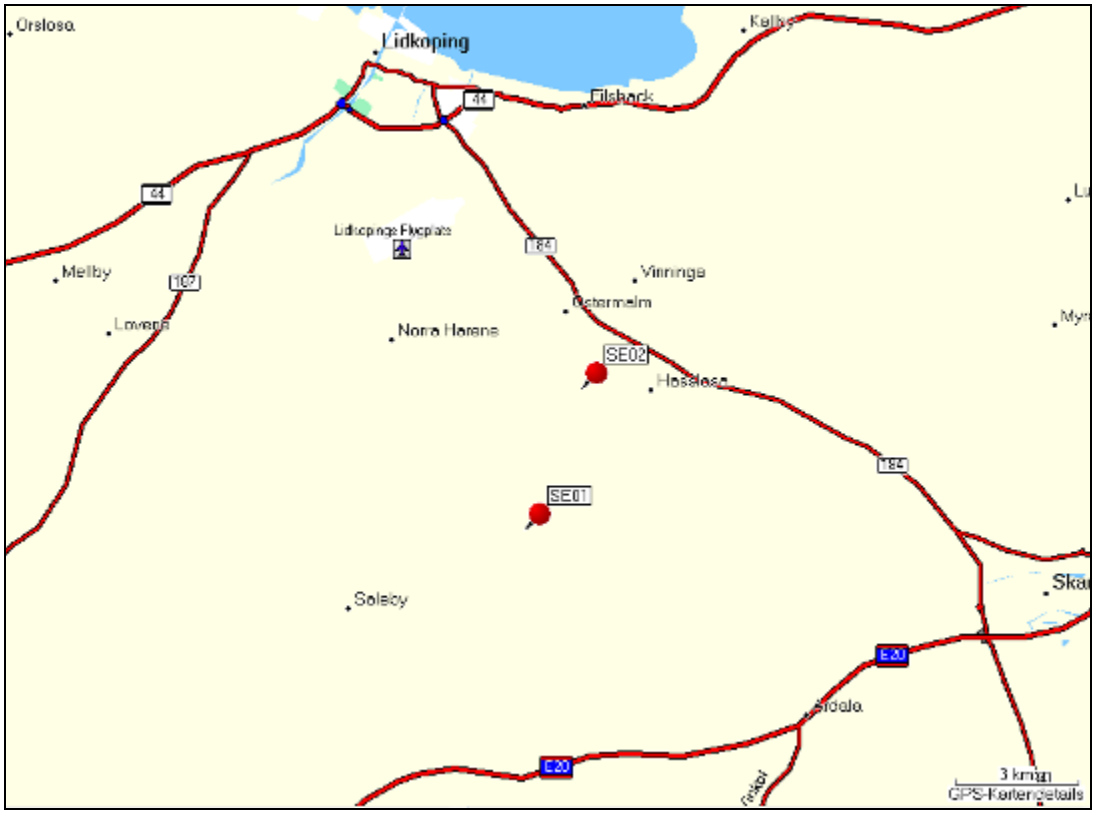
Meier U. (2001): Entwicklungsstadien mono- und dikotyler Pflanzen. BBCH Monografie, 2. Auflage. Biologische Bundesanstalt für Land- und Forstwirtschaft.

Schneider K. and Henkes G. (2011): Monitoring study of potato-feeding organism in commercially cultivated Amflora potato fields and their close vicinity in the Czech Republic, Germany and Sweden. Conducted by RIFCON GmbH for BASF Plant Science Company GmbH.

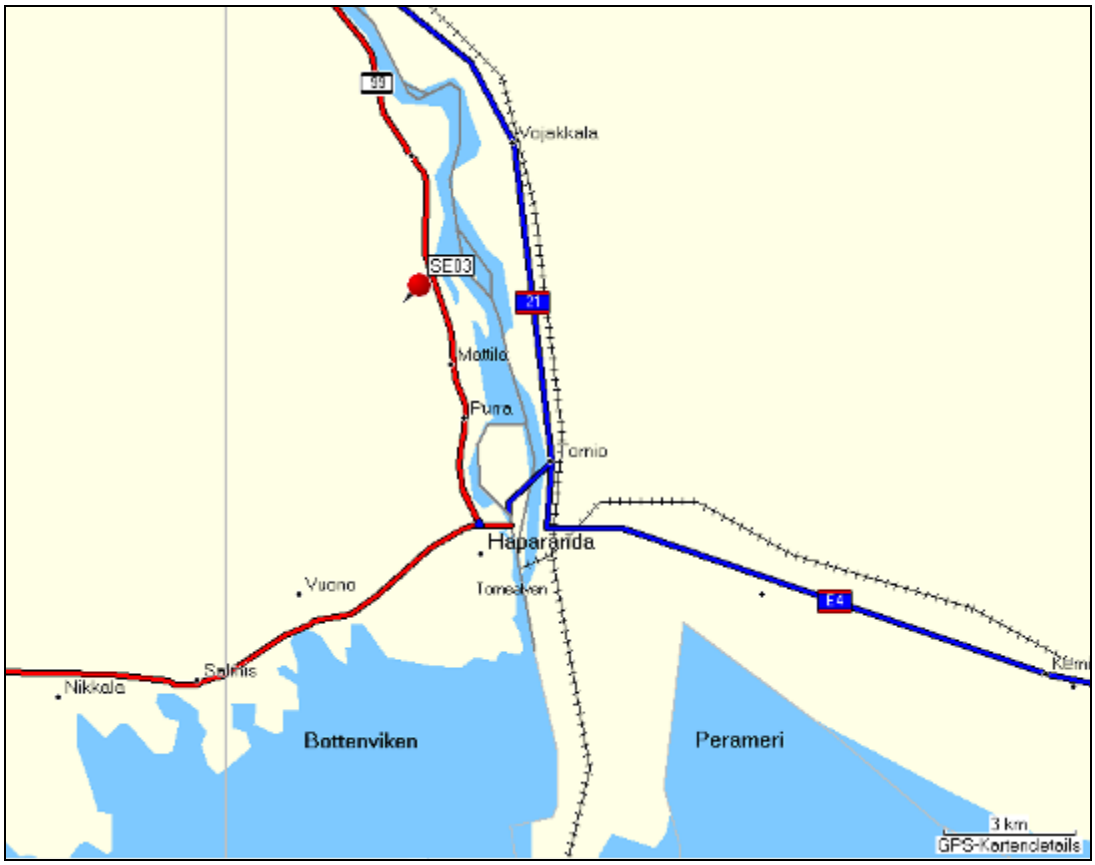
Völk, J. (1965):Die häufigsten an der Kartoffel vorkommenden Blattlausarten in farbiger Darstellung. Biologische Bundesanstalt für Land- und Forstwirtschaft, Merkblatt Nr. 14, Institut für landwirtschaftliche Virusforschung, Braunschweig, Germany.

10 APPENDICES

Appendix 1: Map of the region around Üplingen with the potato field in Germany (DE01)
Source: MapSource (version 6.13.7)



Appendix 2: Map of the region around Lidköping with two study fields in Southern Sweden (SE01 and SE02)
Source: MapSource (version 6.13.7)



Appendix 3: Map of the region around Haparanda with the study field in Northern Sweden (SE03)
Source: MapSource (version 6.13.7)

Appendix 4: Impression of the Swedish potato field SE01

Appendix 5: Impression of the Swedish potato field SE02

Appendix 6: Impression of the Swedish potato field SE03

Appendix 7: Impression of a suction sampling

Appendix 8: Agricultural practice at the study field in Germany

Field	Date of Treatment	Type of Treatment	Product Name	Active Ingredient	Amount [kg/ha]
DE01	07.05.2011	potato planting	-	-	-
	25.05.2011	herbicide	Boxer	Prosulfocarb	4.00 L/ha
		herbicide	Sencor WG	Metribuzin	0.40 kg/ha
		adjuvant	Lebosol+Herbosol	-	0.40 L/ha
	29.05.2011	insecticide	Sumicidin alpha EC	Esfenvalerat	0.30 L/ha
		adjuvant	Arma	-	0.30 L/ha
	31.05.2011	insecticide	Biscaya	Thiacloprid	0.30 L/ha
		adjuvant	Arma	-	0.20 L/ha
	04.06.2011	insecticide	Karate Zeon	lambda-Cyhalothrin	0.075 L/ha
		adjuvant	Arma		0.20 L/ha
	07.06.2011	insecticide	Dantop	Clothianidin	0.15 L/ha
		adjuvant	Arma	-	0.20 L/ha
	11.06.2011	insecticide	Tepekki	Flonicamid	0.16 kg/ha
			Arma	-	0.20 L/ha
	15.06.2011	insecticide	Actara	Thiamethoxam	0.10 kg/ha
			Pirimor-Granulate	Pirimicarb	0.45 kg/ha
		adjuvant	Arma	-	0.20 L/ha
	20.06.2011	fungicide	Epok	Fluazinam + Metalaxyl-M	0.40 L/ha
		fungicide	Vondac DG	Maneb	1.20 kg/ha
		insecticide	Sumicidin alpha EC	Esfenvalerat	0.30 L/ha
	23.06.2011	insecticide	Biscaya	Thiacloprid	0.30 L/ha
		adjuvant	Arma	-	0.20 L/ha
	27.06.2011	fungicide	Infinito	Propamocarb + Fluopicolide	1.60 L/ha
		fungicide	Shirlan	Fluazinam	0.40 L/ha
		insecticide	Karate Zeon	lambda-Cyhalothrin	0.075 L/ha
		insecticide	Pirimor-Granulate	Pirimicarb	0.40 kg/ha
	01.07.2011	insecticide	Dantop	Clothianidin	0.15 L/ha
		fungicide	Fantic M	Mancozeb + Benalaxyl-M	2.50 kg/ha
		adjuvant	Arma	-	0.20 L/ha
	05.07.2011	insecticide	Plenum 50 WG	Pymetrozin	0.30 kg/ha
		fungicide	Orvego Duo	Mancozeb + Ametoctradin	2.50 kg/ha
		fungicide	Signum	Pyraclostrobin + Boscalid	0.25 kg/ha
	09.07.2011	insecticide	Actara	Thiamethoxam	0.10 kg/ha
		insecticide	Pirimor-Granulate	Pirimicarb	0.40 kg/ha
			Arma	-	0.20 L/ha
	11.07.2011	fungicide	Ranman	Cyazofamid	0.20 L/ha
		fungicide	Vondac DG	Maneb	1.20 kg/ha
	13.07.2011	insecticide	Tepekki	Flonicamid	0.16 kg/ha
		adjuvant	Arma	-	0.20 L/ha
	16.07.2011	fungicide	Infinito	Propamocarb + Fluopicolide	1.50 L/ha
		fungicide	Shirlan	Fluazinam	0.40 L/ha
	17.07.2011	insecticide	Sumicidin alpha EC	Esfenvalerat	0.30 L/ha
		adjuvant	Arma	-	0.20 L/ha

Appendix 8 cont'd

Field	Date of Treatment	Type of Treatment	Product Name	Active Ingredient	Amount [kg/ha]
DE01	21.07.2011	fungicide	Orvego Duo	Mancozeb + Ametoctradin	2.50 kg/ha
		insecticide	Actara	Thiamethoxam	0.10 kg/ha
		insecticide	Pirimor-Granulate	Pirimicarb	0.40 kg/ha
	25.07.2011	insecticide	Mospilan SG	Acetamiprid	0.25 kg/ha
		fungicide	Ranman	Cyazofamid	0.20 L/ha
		fungicide	Vondac DG	Maneb	1.20 kg/ha
	26.07.2011	herbicide	Reglone	Deiquat	0.50 L/ha
	29.07.2011	insecticide	Plenum 50 WG	Pymetrozin	0.30 kg/ha
		fungicide	Ranman	Cyazofamid	0.20 L/ha
		herbicide	Reglone	Deiquat	2.50 L/ha
	03.08.2011	insecticide	Actara	Thiamethoxam	0.10 kg/ha
		fungicide	Shirlan	Fluazinam	0.40 L/ha
		herbicide	Shark	Carfentrazone	1.00 L/ha
		adjuvant	Arma	-	0.20 L/ha
	05.08.2011	herbicide	Reglone	Deiquat	1.00 L/ha
		adjuvant	Arma	-	0.20 L/ha
		insecticide	Sumicidin alpha EC	Esfenvalerat	0.30 L/ha
	31.08.-01.09.2011	potato harvest	-	-	-

Appendix 9: Agricultural practice at the study fields in Sweden

Field	Date of Treatment	Type of Treatment	Product Name	Active Ingredient	Amount [kg/ha]
SE01	08.05.2011	potato planting	Monceren	pencycaron	1.8 L/ha
	31.05.2011	herbicide	Sencor	metribuzin	0.25 L/ha
	31.05.2011	herbicide	Fenix	Aclonifen	3.0 L/ha
	13.06.2011	insecticide	Sumi-alpha Oil	Esfenvalerat Minerla Oil	0.2 L/ha 5.0 L/ha
	22.06.2011	insecticide fungicide	Mavrik Oil Revus	Taufuvalinat Mineral oil Mandipropamid Propandiol	0.2 L/ha 5.0 L/ha 0.6 L/ha L
	29.06.2011	insecticide fungicide	Mavrik Oil Tatto	Taufuvalinat Mineral oil Mankozeb/Propamokarb	0.25 L/ha 6.0 L/ha 2.0 L/ha
	07.07.2011	insecticide fungicide	Mavrik Oil Ranman	Taufuvalinat Mineral Oil Cyazofamid	0.25 L/ha 7.0 L/ha 0.2 L/ha
	16.07.2011	insecticide fungicide	Pirimor Oil Ranman	Primikarb Mineral Oil Cyazofamid	0.3 L/ha 7.0 L/ha 0.2 L/ha
	22.07.2011	insecticide fungicide	Sumi-alpha Oil Ranman	Esfenvalerat Minerla Oil Cyazofamid	0.25 L/ha 7.0 L/ha 0.2 L/ha
	28.07.2011	insecticide fungicide	Sumi-alpha Oil Revus	Esfenvalert Mineral Oil Mandipropamid/Propandiol	0.25 L/ha 7.0 L/ha 0.6 L/ha
	04.08.2011 23.08.2011	insecticide fungicide insecticide	Sumi-alpa Oil Ranman Sumi-alpha	Esfenvalert Mineral Oil Cyazofamid Esfenvalert	0.25 L/ha 7.0 L/ha 0.2 L/ha 0.25L/ha
	17.-18.-24.-25.09.2011	potato harvest	-	-	-
SE02	07.05.2011	potato planting	Maxim	Mefenoxam-fludioxinil	1.1 L/ha
	03.06.2011	herbicide	Sencor	Mettribuzin	0.45 kg/ha
	16.06.2011	insecticide	Sumi-alpha Oil	Esfenvalert Mineral oil	0.26 L/ha 4 L/ha
	22.06.2011	insecticide fungicide	Mospilan Oil Tatto	Acetamiprid Mineral oil Propamokarb,mankozeb	150 g/ha 5 L/ha 2 L/ha
	29.06.2011	insecticide fungicide	Mavrik Oil Tatto	Taufuvalinat Mineral Oil Propamokarb/Mankozeb	0.25 L/ha 6.0 L/ha 2.0 L/ha
	06.07.2011	insecticed fungicide	Mavrik Oil Ranman	Taufuvalinat Mineral Oil Cyazofamid	0.25 L/ha 6.0 L/ha 0.2 L/ha
	11.07.2011	insecticide fungicide	Sumi-alpha Epok	Esfenvalert Mineral Oil Mefenoxam/Fluazinam	0.26 L/ha 6.0 L/ha 0.5 L/ha
	14.07.2011	insecticide fungicide	Sumi-alpha Oil Tatto	Esfenvalert Mineral oil Propamokarb/Mankozeb	0.26 L/ha 6.0 L/ha 2.0 L/ha
	20.07.2011	insecticide fungicide	Mospilan Oil Ranman	Acetamiprid Mineral oil Cyazofamid	175 g/ha 7.0 L/ha 0.2 L/ha
	26.07.2011	insecticide fungicide	Mospilan Oil Ranman	Acetamidprid Mineral Oil Cyazofamid	175 g/ha 7.0 L/ha 0.2 L/ha

Appendix 9 cont'd

Field	Date of Treatment	Type of Treatment	Product Name	Active Ingredient	Amount [kg/ha]
SE02	02.08.2011	insecticide fungicide	Mavrik Oil Ranman	Taufualinat Mineral Oil Cyazofamid	0.25 L/ha 7.0 L/ha 0.2 L/ha
	27.-29.09.2011	potato harvest	-	-	-
SE03	09.06.2011	potato planting	Maxim	Mefenoxam-fludioxinil	1.0 L/ha
	27.06.2011	herbicide	Sencor/Sunocco	metribuzin/oil	0.5 kg/ha
	04.07.2011	herbicide (half of the field)	Titus	Rimsulfuron	40.0 g/ha
	11.07.2011	insecticide	Biscaya	Thiacloprid	0.7 L/ha
	11.07.2011	fungicide	Sunocco Tatto	Oil Propamokarb/mankozeb	5.0 L/ha 4.0 L/ha
	25.07.2011	insecticide	Beta-Baytriod Sunocco	Betacylflutrin Oil	0.4 L/ha 6.0 L/ha
	25.07.2011	fungicide	Tatto	Propamokarb/mankozeb	2 L/ha
	05.08.2011	insecticide	Beta-Baytriod Sunocco	Betacylflutrin Oil	0.4 L/ha 5.0 L/ha
	05.08.2011	fungicide	Ranman	Cyazofamid	0.2 L/ha
	1.08.2011	insecticide	Beta-Baytriod	Betacylflutrin	0.4 L/ha
	17.08.2011	insecticide	Sunocco	Oil	5.0 L/ha
	17.08.2011	fungicide	Ranman	Cyazofamid	0.2 L/ha
	16.-19.09.2011	potato harvest	-	-	-

Appendix 10: GPS coordinates (UTM, WGS 84) of the transects on the study fields

Study field-transect code	GPS coordinates of the transect (UTM, WGS 84)
DE01-1	32 U 646080 5776836
DE01-2	32 U 646056 5776851
DE01-3	32 U 646027 5776864
DE01-4	32 U 646001 5776884
DE01-5	32 U 645978 5776897
DE01-6	32 U 645947 5776908
DE01-A	32 U 646115 5776827
DE01-B	32 U 645922 5776915
DE01-C	32 U 645956 5776840
DE01-D	32 U 645989 5776770
DE01-E	32 U 646078 5776908
DE01-F	32 U 646049 5776970
SE01-1	33 V 396316 6474814
SE01-2	33 V 396335 6474681
SE01-3	33 V 396356 6474572
SE01-4	33 V 396379 6474458
SE01-5	33 V 396397 6474356
SE01-6	33 V 396411 6474261
SE01-A	33 V 396291 6474914
SE01-B	33 V 396348 6474532
SE01-C	33 V 396384 6474535
SE01-D	33 V 396413 6474233
SE01-E	33 V 396405 6474155
SE01-F	33 V 396328 6474929
SE02-1	33 V 397806 6478199
SE02-2	33 V 397891 6478217
SE02-3	33 V 397967 6478219
SE02-4	33 V 397932 6478270
SE02-5	33 V 397909 6478347
SE02-6	33 V 397889 6478424
SE02-A	33 V 397880 6478497
SE02-B	33 V 398011 6478270
SE02-C	33 V 397801 6478080
SE02-D	33 V 397726 6478213
SE02-E	33 V 397911 6478271
SE02-F	33 V 397776 6478497
SE03-1	35 W 367725 7310799
SE03-2	35 W 367798 7310822
SE03-3	35 W 367871 7310850
SE03-4	35 W 367939 7310858
SE03-5	35 W 367991 7310910
SE03-6	35 W 368047 7310922
SE03-A	35 W 368062 7310920
SE03-B	35 W 367846 7310926
SE03-C	35 W 367635 7310915
SE03-D	35 W 367649 7310774
SE03-E	35 W 368089 7310797
SE03-F	35 W 367868 7310783

Appendix 11: Weather data for the study site in Germany

Temperature data were obtained from the nearest weather recording station in Ummendorf (GPS data, UTM, WGS 84: 32 U 648884 5781257, altitude: 162 m; source: Deutscher Wetterdienst, http://premium.dwd.de/weste/xl_1.jsp).
Daily rainfall measurements were obtained from the nearest weather recording station in Barneberg (GPS data, UTM, WGS 84: 32 U 642372 5776080, altitude: 143 m; source: Deutscher Wetterdienst, http://premium.dwd.de/weste/xl_1.jsp)

Date [dd.mm.yyyy]	Mean [°C]	Max [°C]	Min [°C]	Precipitation [mm]
01.07.2011	13.4	19.4	8.3	0.2
02.07.2011	11.3	14.3	9.8	16.7
03.07.2011	12.5	13.6	11.1	7.4
04.07.2011	13.7	15.5	12.2	0.5
05.07.2011	15.8	20.6	12.8	0.0
06.07.2011	19.4	27.4	12.0	9.8
07.07.2011	19.4	25.1	13.0	1.0
08.07.2011	18.7	24.5	14.7	0.0
09.07.2011	20.7	28.2	12.8	0.0
10.07.2011	18.5	24.1	15.7	2.1
11.07.2011	19.2	24.9	13.7	0.0
12.07.2011	20.0	26.7	12.1	1.1
13.07.2011	18.9	23.6	14.9	28.9
14.07.2011	15.9	20.3	13.0	0.0
15.07.2011	14.1	17.1	11.1	0.0
16.07.2011	18.5	25.7	9.8	0.0
17.07.2011	17.6	22.5	12.3	2.1
18.07.2011	16.0	22.3	11.2	0.0
19.07.2011	17.1	24.0	10.1	0.0
20.07.2011	18.7	23.6	13.4	0.0
21.07.2011	16.8	19.9	13.7	0.0
22.07.2011	13.6	15.7	11.9	0.0
23.07.2011	14.2	19.7	10.3	0.0
24.07.2011	12.8	15.5	9.6	0.0
25.07.2011	13.9	17.7	11.4	0.5
26.07.2011	17.8	24.4	9.9	0.0
27.07.2011	18.8	25.7	10.8	0.0
28.07.2011	18.3	22.9	13.1	0.0
29.07.2011	15.9	20.3	13.2	8.2
30.07.2011	14.4	17.2	12.4	3.1
31.07.2011	13.3	14.8	11.8	2.7
for July 2011	**Mean: 16.4**	**Max: 28.2**	**Min: 8.3**	**Total: 84.3**

Appendix 12: Weather data for July 2011 for the study sites in Sweden

Precipitation and temperature data were obatained from the nearest weather recording station at Vojakkala (Northern Sweden) and Vinninga (Southern Sweden). Source: www.klart.se

Date [dd.mm.yyyy]	Vojakkala		Vinninga	
	Precipitation [mm]	Temperature [°C]	Precipitation [mm]	Temperature [°C]
01.07.2011	0.6	20.0	1.7	18.0
02.07.2011	3.7	17.7	1.3	18.6
03.07.2011	0.0	15.4	0.7	20.1
04.07.2011	0.0	14.9	0.7	17.2
05.07.2011	0.0	15.1	1.1	18.3
06.07.2011	0.0	16.4	0.3	18.8
07.07.2011	0.0	19.0	7.8	18.2
08.07.2011	0.0	21.4	5.3	17.9
09.07.2011	1.4	23.4	4.6	17.8
10.07.2011	3.3	20.0	0.0	17.5
11.07.2011	0.0	19.5	0.1	17.1
12.07.2011	10.7	17.0	0.6	16.2
13.07.2011	0.0	14.9	0.0	14.8
14.07.2011	0.0	14.9	17.1	14.7
15.07.2011	0.0	14.1	9.6	14.9
16.07.2011	1.5	15.0	0.7	15.6
17.07.2011	0.0	16.2	6.5	16.0
18.07.2011	3.1	17.0	2.9	16.3
19.07.2011	2.6	17.7	5.7	17.1
20.07.2011	0.0	17.6	1.5	16.5
21.07.2011	0.1	18.7	3.5	16.3
22.07.2011	0.0	21.0	31.6	18.6
23.07.2011	9.1	20.0	8.6	20.2
24.07.2011	19.8	19.5	2.7	14.6
25.07.2011	0.1	17.8	1.9	15.0
26.07.2011	0.6	19.1	0.3	16.8
27.07.2011	2.2	18.7	0.0	17.8
28.07.2011	0.0	18.1	2.1	19.2
29.07.2011	0.0	17.7	2.8	20.3
30.07.2011	1.0	18.0	6.4	19.6
31.07.2011	0.0	17.3	0.0	19.4
for July 2011	**Total: 59.8**	**Mean: 17.8**	**Total: 128.1**	**Mean: 17.4**

Appendix 13: Weather data for August 2011 for the study site in Northern Sweden

Precipitation and temperature data were obatained from the nearest weather recording station at Vojakkala (Northern Sweden). Source: www.klart.se

Date [dd.mm.yyyy]	Vojakkala	
	Precipitation [mm]	Temperature [°C]
01.08.2011	0.0	15.5
02.08.2011	0.0	14.7
03.08.2011	0.1	18.7
04.08.2011	0.0	15.5
05.08.2011	0.0	12.3
06.08.2011	0.2	13.0
07.08.2011	0.4	14.8
08.08.2011	13.7	12.4
09.08.2011	3.2	13.1
10.08.2011	7.8	11.9
11.08.2011	1.3	10.8
12.08.2011	0.2	10.1
13.08.2011	0.0	12.1
14.08.2011	0.0	13.2
15.08.2011	0.0	15.0
16.08.2011	0.0	16.4
17.08.2011	6.9	14.7
18.08.2011	9.6	13.0
19.08.2011	2.9	11.5
20.08.2011	0.2	13.6
21.08.2011	1.0	13.4
22.08.2011	5.0	14.9
23.08.2011	11.4	14.4
24.08.2011	0.0	14.1
25.08.2011	0.1	13.2
26.08.2011	0.8	15.1
27.08.2011	0.2	16.6
28.08.2011	2.8	17.0
29.08.2011	0.0	15.3
30.08.2011	0.0	14.2
31.08.2011	0.0	11.7
for August 2011	**Total: 67.8**	**Mean: 13.9**

Appendix 14: Abundance of aphid species per transect at the Amflora field in Germany (study field DE01)

Number of individuals over 30 leaves taken from 30 plants per transect. Mean: n=12 transects, SD= Standard deviation.

Species	Stage	Sampling Transect												Mean	SD
		1	2	3	4	5	6	7*	8*	9*	10*	11*	12*		
Aphis frangulae	adult wingless	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	adult winged	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	juvenile	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	mummy	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	total	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Aphis nasturii	adult wingless	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	adult winged	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	juvenile	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	mummy	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	total	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Myzus persicae	adult wingless	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	adult winged	0	0	0	0	0	0	0	0	1	0	1	0	0.17	0.39
	juvenile	1	0	0	0	0	0	0	0	0	0	3	0	0.33	0.89
	mummy	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	total	1	0	0	0	0	0	0	0	1	0	4	0	0.50	1.17
Total Aphids	adult wingless	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	adult winged	0	0	0	0	0	0	0	0	1	0	1	0	0.17	0.39
	juvenile	1	0	0	0	0	0	0	0	0	0	3	0	0.33	0.89
	mummy	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	total	1	0	0	0	0	0	0	0	1	0	4	0	0.50	1.17

* sample was taken from the field margin (=vicinity)

Appendix 15: Abundance of aphid species per transect at the first Amflora field in Sweden (study field SE01)

Number of individuals over 30 leaves taken from 30 plants per transect. Mean: n=12 transects, SD= Standard deviation.

Species	Stage	Sampling Transect												Mean	SD
		1	2	3	4	5	6	7*	8*	9*	10*	11*	12*		
Aphis frangulae	adult wingless	0	0	0	0	0	0	1	0	0	0	0	2	0.25	0.62
	adult winged	0	0	0	0	0	0	0	0	0	0	0	1	0.08	0.29
	juvenile	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	mummy	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	total	0	0	0	0	0	0	1	0	0	0	0	3	0.33	0.89
Aphis nasturii	adult wingless	0	3	0	0	0	0	5	4	6	0	2	3	1.92	2.23
	adult winged	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	juvenile	0	9	0	0	0	0	6	6	10	0	0	13	3.67	4.87
	mummy	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	total	0	12	0	0	0	0	11	10	16	0	2	16	5.58	6.79
Myzus persicae	adult wingless	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	adult winged	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	juvenile	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	mummy	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	total	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Total Aphids	adult wingless	0	3	0	0	0	0	6	4	6	0	2	5	2.17	2.52
	adult winged	0	0	0	0	0	0	0	0	0	0	0	1	0.08	0.29
	juvenile	0	9	0	0	0	0	6	6	10	0	0	13	3.67	4.87
	mummy	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	total	0	12	0	0	0	0	12	10	16	0	2	19	5.92	7.32

* sample was taken from the field margin (=vicinity)

Appendix 16: Abundance of aphid species per transect at the second Amflora field in Sweden (study field SE02)

Number of individuals over 30 leaves taken from 30 plants per transect. Mean: n=12 transects, SD= Standard deviation.

Species	Stage	Sampling Transect												Mean	SD
		1	2	3	4	5	6	7*	8*	9*	10*	11*	12*		
Aphis frangulae	adult wingless	0	2	5	2	3	5	6	2	8	9	13	12	5.58	4.17
	adult winged	1	0	1	0	0	0	0	0	0	0	0	0	0.17	0.39
	juvenile	5	42	77	11	23	76	40	28	218	70	99	110	66.58	58.51
	mummy	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	total	6	44	83	13	26	81	46	30	226	79	112	122	72.33	61.23
Aphis nasturii	adult wingless	1	0	0	3	0	0	0	0	2	1	1	1	0.75	0.97
	adult winged	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	juvenile	7	13	12	3	0	0	0	0	2	3	7	4	4.25	4.59
	mummy	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	total	8	13	12	6	0	0	0	0	4	4	8	5	5.00	4.61
Myzus persicae	adult wingless	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	adult winged	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	juvenile	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	mummy	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	total	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Total Aphids	adult wingless	1	2	5	5	3	5	6	2	10	10	14	13	6.33	4.40
	adult winged	1	0	1	0	0	0	0	0	0	0	0	0	0.17	0.39
	juvenile	12	55	89	14	23	76	40	28	220	73	106	114	70.83	58.56
	mummy	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	total	14	57	95	19	26	81	46	30	230	83	120	127	77.33	61.52

* sample was taken from the field margin (=vicinity)

Appendix 17: Abundance of aphid species per transect at the second Amflora field in Sweden (study field SE03)

Number of individuals over 30 leaves taken from 30 plants per transect. Mean: n=12 transects, SD= Standard deviation.

Species	Stage	Sampling Transect												Mean	SD
		1	2	3	4	5	6	7*	8*	9*	10*	11*	12*		
Aphis frangulae	adult wingless	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	adult winged	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	juvenile	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	mummy	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	total	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Aphis nasturii	adult wingless	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	adult winged	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	juvenile	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	mummy	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	total	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Myzus persicae	adult wingless	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	adult winged	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	juvenile	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	mummy	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	total	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Total Aphids	adult wingless	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	adult winged	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	juvenile	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	mummy	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	total	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00

* sample was taken from the field margin (=vicinity)

Appendix 18: Abundance of phytophagous arthropods (suction sampling) per transect at the Amflora field in Germany (study field DE01)

Number of individuals sampled by sucking from 10 plants per transect. Mean: n=12 transects, SD= Standard deviation. In grey: phytophagous taxa.

Taxa	Sampling Transect												Mean	SD
	1	2	3	4	5	6	7*	8*	9*	10*	11*	12*		
Araneae	1	7	0	5	1	0	4	11	5	6	3	11	4.50	3.83
Acari	0	0	0	0	0	0	0	0	1	0	0	0	0.08	0.29
Collembola	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Thysanoptera	79	30	43	45	42	54	99	125	123	76	53	89	71.50	32.21
Miridae (Heteroptera)	0	1	0	1	0	1	0	3	2	1	1	0	0.83	0.94
Heteroptera (other)	2	1	1	1	0	0	0	5	4	7	3	2	2.17	2.21
Auchenorrhyncha	0	0	0	0	0	1	0	1	0	3	0	0	0.42	0.90
Psyllina	0	0	0	1	0	0	1	0	0	0	0	0	0.17	0.39
Aphidina	22	4	5	8	0	3	28	31	31	16	16	28	16.00	11.79
Hymenoptera (without Formicidae)	23	20	13	19	11	14	21	29	56	63	32	23	27.00	16.43
Formicidae	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Neuroptera adult	2	0	2	2	0	1	6	1	0	1	1	0	1.33	1.67
Neuroptera juvenile	0	1	0	1	1	0	0	0	1	3	0	1	0.67	0.89
Neuroptera total	2	1	2	3	1	1	6	1	1	4	1	1	2.00	1.60
Lepidoptera adult	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Lepidoptera juv.	0	0	0	0	0	0	0	0	0	1	0	0	0.08	0.29
Ephemeroptera	0	0	1	0	0	0	0	0	0	0	0	0	0.08	0.29
Psocoptera	0	0	0	0	0	0	0	1	0	0	0	0	0.08	0.29
Diptera adult	98	135	66	47	68	49	22	70	89	93	28	12	64.75	35.66
Diptera juvenile	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Carabidae	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Staphilinidae	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Nitidulidae	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Chrysomelidae	0	0	0	0	0	0	1	0	0	1	0	1	0.25	0.45
Curculionidae	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Coleoptera (phytophagous groups)	0	0	0	0	0	0	1	0	0	1	0	1	0.25	0.45
Coleoptera (other)	0	0	0	1	0	0	0	2	6	2	0	1	1.00	1.76
Aleyrodina	17	0	0	0	0	0	0	0	1	2	0	0	1.67	4.87
Dermaptera	0	0	0	0	0	0	0	0	0	1	1	5	0.58	1.44
Total	244	199	131	131	123	123	182	279	319	276	138	173	193.17	69.96
Total Phytophagous	120	36	49	56	42	59	129	165	161	107	73	120	93.08	46.19
Other Arthropods	124	163	82	75	81	64	53	114	158	169	65	53	100.08	43.81
[%] Phytophagous	49	18	37	43	34	48	71	59	51	39	53	69	48	15

* sample was taken from the study field margin (=vicinity)

Appendix 19: Abundance of phytophagous arthropods (suction sampling) per transect at the first Amflora field in Sweden (study field SE01)

Number of individuals sampled by sucking from 10 plants per transect. Mean: n=12 transects, SD= Standard deviation. In grey: phytophagous taxa.

Taxa	Sampling Transect												Mean	SD
	1	2	3	4	5	6	7*	8*	9*	10*	11*	12*		
Araneae	2	0	1	3	0	3	2	0	5	1	2	0	1.58	1.56
Acari	1	1	0	0	1	0	0	0	0	0	0	0	0.25	0.45
Collembola	0		1	0	0	2	1	0	0	0	0	1	0.45	0.69
Thysanoptera	8	4	3	10	3	8	2	6	19	6	7	6	6.83	4.51
Miridae (Heteroptera)	2	2	1	0	0	2	0	0	0	4	1	3	1.25	1.36
Heteroptera (other)	0	0	0	0	0	1	0	0	0	0	0	0	0.08	0.29
Auchenorrhyncha	0	0	0	0	0	0	1	0	0	0	1	0	0.17	0.39
Psyllina	0	0	0	0	0	1	0	0	0	0	2	0	0.25	0.62
Aphidina	41	148	95	39	85	116	54	48	55	91	182	71	85.42	44.67
Hymenoptera (without Formicidae)	41	29	20	24	11	24	20	28	28	12	24	12	22.75	8.61
Formicidae	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Neuroptera adult	0	0	0	0	0	0	1	0	0	0	0	0	0.08	0.29
Neuroptera juvenile	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Neuroptera total	0	0	0	0	0	0	1	0	0	0	0	0	0.08	0.29
Lepidoptera adult	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Lepidoptera juv.	0	0	0	1	0	0	0	0	0	2	1	0	0.33	0.65
Ephemeroptera	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Psocoptera	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Diptera adult	11	16	14	7	14	13	11	10	12	10	1	13	11.00	3.93
Diptera juvenile	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Carabidae	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Nitidulidae	0	0	0	0	0	0	1	0	0	0	0	0	0.08	0.29
Chrysomelidae	0	0	0	0	0	0	0	0	1	0	0	0	0.08	0.29
Curculionidae	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Coleoptera (phytophagous groups)	0	0	0	0	0	0	1	0	1	0	0	0	0.17	0.39
Coleoptera (other)	1	1	0	0	0	0	1	0	0	0	0	1	0.33	0.49
Aleyrodina	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Dermaptera	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Total	107	201	135	84	114	170	94	92	120	126	221	107	130.92	43.92
Total Phytophagous	51	154	100	50	88	130	59	54	75	103	194	81	94.92	44.90
Other Arthropods	56	47	35	34	26	40	35	38	45	23	27	26	36.00	9.90
[%] Phytophagous	48	77	74	60	77	77	63	59	63	82	88	76	70	12

* sample was taken from the study field margin (=vicinity)

Appendix 20: Abundance of phytophagous arthropods (suction sampling) per transect at the first Amflora field in Sweden (study field SE02)

Number of individuals sampled by sucking from 10 plants per transect. Mean: n=12 transects, SD= Standard deviation. In grey: phytophagous taxa.

Taxa	Sampling Transect												Mean	SD
	1	2	3	4	5	6	7*	8*	9*	10*	11*	12*		
Araneae	0	0	0	1	0	0	0	1	2	1	0	0	0.42	0.67
Acari	0	0	0	0	0	0	1	0	0	0	0	0	0.08	0.29
Collembola	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Thysanoptera	7	3	3	2	5	0	0	3	3	4	5	20	4.58	5.25
Miridae (Heteroptera)	0	0	0	0	0	0	0	0	0	1	0	0	0.08	0.29
Heteroptera (other)	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Auchenorrhyncha	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Psyllina	2	0	0	0	0	0	0	1	0	0	1	2	0.50	0.80
Aphidina	1	3	2	2	0	0	17	4	1	7	0	4	3.42	4.76
Hymenoptera (without Formicidae)	12	7	10	20	7	11	18	13	31	21	26	13	15.75	7.55
Formicidae	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Neuroptera adult	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Neuroptera juvenile	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Neuroptera total	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Lepidoptera adult	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Lepidoptera juv.	0	1	0	0	0	0	0	1	0	0	0	0	0.17	0.39
Ephemeroptera	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Psocoptera	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Diptera adult	5	3	3	9	2	4	33	12	11	5	2	14	8.58	8.73
Diptera juvenile	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Carabidae	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Nitidulidae	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Chrysomelidae	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Curculionidae	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Coleoptera (phytophagous groups)	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Coleoptera (other)	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Aleyrodina	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Dermaptera	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Total	27	17	18	34	14	15	69	35	48	39	34	53	33.58	16.95
Total Phytophagous	10	7	5	4	5	0	17	9	4	12	6	26	8.75	7.00
Other Arthropods	17	10	13	30	9	15	52	26	44	27	28	27	24.83	13.22
[%] Phytophagous	37	41	28	12	36	0	25	26	8	31	18	49	26	14

* sample was taken from the study field margin (=vicinity)

Appendix 21: Abundance of phytophagous arthropods (suction sampling) per transect at the first Amflora field in Sweden (study field SE03)

Number of individuals sampled by sucking from 10 plants per transect. Mean: n=12 transects, SD= Standard deviation. In grey: phytophagous taxa.

Taxa	Sampling Transect												Mean	SD
	1	2	3	4	5	6	7*	8*	9*	10*	11*	12*		
Araneae	5	0	0	1	4	3	1	0	12	4	0	3	2.75	3.44
Acari	0	0	0	2	0	0	1	0	1	0	0	0	0.33	0.65
Collembola	0	0	0	0	1	1	0	2	2	2	0	0	0.67	0.89
Thysanoptera	2	0	0	0	1	4	5	0	11	11	8	4	3.83	4.17
Miridae (Heteroptera)	2	0	0	0	0	0	0	0	0	4	3	1	0.83	1.40
Heteroptera (other)	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Auchenorrhyncha	0	0	0	0	0	0	0	0	2	0	0	2	0.33	0.78
Psyllina	0	0	0	0	0	0	1	0	0	1	0	0	0.17	0.39
Aphidina	1	1	1	0	0	5	5	0	4	5	1	6	2.42	2.35
Hymenoptera (without Formicidae)	4	1	6	1	7	13	8	7	13	18	2	6	7.17	5.24
Formicidae	0	0	0	0	0	0	1	0	0	0	0	0	0.08	0.29
Neuroptera adult	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Neuroptera juvenile	0	1	0	0	1	2	0	0	0	2	1	1	0.67	0.78
Neuroptera total	0	1	0	0	1	2	0	0	0	2	1	1	0.67	0.78
Lepidoptera adult	0	0	0	0	1	0	0	0	0	0	0	0	0.08	0.29
Lepidoptera juv.	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Ephemeroptera	4	2	0	1	0	18	3	2	0	0	3	4	3.08	4.94
Psocoptera	0	2	0	0	0	0	0	0	2	0	1	0	0.42	0.79
Diptera adult	73	88	128	58	140	129	76	162	98	97	75	95	101.58	31.50
Diptera juvenile	0	0	0	0	0	0	0	0	0	2	0	0	0.17	0.58
Carabidae	0	0	0	0	0	0	0	0	0	1	0	0	0.08	0.29
Staphylinidae	0	0	0	0	0	0	0	0	0	1	0	0	0.08	0.29
Nitidulidae	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Chrysomelidae	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Curculionidae	0	0	0	0	0	0	0	0	0	1	0	0	0.08	0.29
Coleoptera (phytophagous groups)	0	0	0	0	0	0	0	0	0	1	0	0	0.08	0.29
Coleoptera (other)	0	0	0	0	0	0	1	0	0	1	0	0	0.17	0.39
Aleyrodina	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Dermaptera	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Total	91	95	135	63	155	175	102	173	145	150	94	122	125.00	35.96
Total Phytophagous	5	1	1	0	3	10	11	2	19	24	12	13	8.42	7.75
Other Arthropods	86	94	134	63	152	165	91	171	126	126	82	109	116.58	34.73
[%] Phytophagous	6	1	1	0	2	6	11	1	13	16	13	11	7	6

* sample was taken from the study field margin (=vicinity)