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BLACK BEAN APHID (*Aphis fabae*) monitoring and forecasts – 17 September 2020

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Rothamsted Insect Survey and SASA suction trap captures 2020

The table below summarises suction trap captures for 2020. Cells shaded in grey indicate that information is not available yet from these traps due to COVID-19. Some of the trap counts are based on less than 7 days' data.

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Aphis fabae Week ending	Inverness	Dundee	Edinburgh	Ayr	Newcastle	FERA, York	Preston	Kirton	Broom's Barn	Wellesbourne	Hereford	Rothamsted	Writtle	Ascot	East Malling	Starcross	Total
05-Apr					0	0		0	0	0	0	0	0	0	0	0	0
12-Apr					0	0		0	0	0	0	0	0	0	0	0	0
19-Apr					0	0		0	0	0	0	0	0	0	0	0	0
26-Apr					0	0		0	0	0	0	0	0	0	0	0	0
03-May					0	0	1	0	0		0	0	0	0	0	0	1
10-May								0	0			0		0	1	0	1
17-May						0	2	0	0	0	0	0		0		2	4
24-May	0		0					0	0			0			2	2	4
31-May	0	0	0			0		4	1	2		0		0	9	4	20
07-Jun	0	0	0			0	0	1	4	0		0	4		2	6	17
14-Jun						0	0	4	0	0		8			9	48	69
21-Jun			1			0	2	4	14	5		19		7	9	0	61
28-Jun		1	1			10	9	24	4	7	2	6		5	16	0	85
05-Jul	0	2	1		0	0	3	22	5	15	1	15	28	6	12	2	112
12-Jul	0	1	1		0	1	1	156	8	10	3	44	38	12	28	1	304
19-Jul	0	4	1		0	3	0	71	9	15	3	57	17	9	13	5	207
26-Jul	0	30	2		0	1		105	7	20		30	2	6	6	0	209
02-Aug	2	14	5		0	3	0	65	5	11	2	0	4	1	5	0	117
09-Aug	1	29	8		3	1	6	4	2	9		1	0	1	2	0	67
16-Aug	2	2	7		3	12	3	0	0	18	11	0	0	0	0	0	58
23-Aug		5	0		15	0		0	0	0	0	0	0	0	0	0	20
30-Aug	0	0	4		5	0	0	0	0	0	0	0		0	0	0	9
06-Sep		5	2		0	0	0	0	0	1	0	0	0	0	0	0	8

AHDB yellow water trap data

AHDB supports the provision of aphid count data from a network of yellow water traps. The aphids are identified by staff at Fera.

All the individual counts are available at: <https://secure.fera.defra.gov.uk/aphmon/>. You can click on a region on the map to see the counts in more detail.

Although the focus of the commentary on the site is on aphids that transmit potato viruses, there are graphs to show the weekly counts of individual aphid species. The most recent set of counts for aphids of interest are summarised below:

Region	No. of samples taken between 02/09/2020 to 10/09/2020	Average Aphis fabae per sample
North Scotland	0	-
Grampian	4	1.8
Angus & Perthshire	0	-
Borders	0	-
Northern England	0	-
East Anglia	2	0.5
Midlands	0	-
South-West	0	-
Total	6	1.3

Forecasts 2020

The timing of the migration of *Aphis fabae* at any location can be predicted using the mean air temperature and the site's latitude and longitude. A range of equations were produced in Project FV 407a describing the relationships between the dates of first, 10% and 50% capture of aphids in suction traps and the mean air temperature over different periods and site latitude and longitude. These are the predictions for 2020 based on the mean temperature during January to April and then the mean temperature during January to May.

	Mean temperature during January to April			Mean temperature during January to May	
	First aphid	10% aphids	50% aphids	10% aphids	50% aphids
Cornwall	15-May-20	10-Jun-20	8-Jul-20	8-Jun-20	7-Jul-20
Kent	30-Apr-20	12-Jun-20	2-Jul-20	9-Jun-20	1-Jul-20
Suffolk	4-May-20	17-Jun-20	6-Jul-20	16-Jun-20	5-Jul-20
Wellesbourne	12-May-20	17-Jun-20	10-Jul-20	13-Jun-20	8-Jul-20
Norfolk	10-May-20	22-Jun-20	10-Jul-20	21-Jun-20	10-Jul-20
South Lincs	12-May-20	21-Jun-20	12-Jul-20	17-Jun-20	9-Jul-20
Nottingham	22-May-20	28-Jun-20	18-Jul-20	25-Jun-20	16-Jul-20
Lancashire	30-May-20	1-Jul-20	23-Jul-20	28-Jun-20	21-Jul-20
York	22-May-20	29-Jun-20	19-Jul-20	27-Jun-20	18-Jul-20
Scotland	4-Jun-20	18-Jul-20	31-Jul-20	17-Jul-20	31-Jul-20

These are the equations on which the predictions are based:

Measure of timing of aphid activity	Mean temperature during	Fitted equation (Time in days from 1 January)
First	Jan-Apr	$\text{Time} = 64 - 9.70 * \text{mean temp} + 2.67 * \text{latitude} - 4.19 * \text{longitude}$
10%	Jan-Apr	$\text{Time} = 60 - 7.78 * \text{mean temp} + 3.24 * \text{latitude} - 1.21 * \text{longitude}$
10%	Jan-May	$\text{Time} = 96 - 9.11 * \text{mean temp} + 2.88 * \text{latitude} - 1.04 * \text{longitude}$
50%	Jan-Apr	$\text{Time} = 57 - 5.23 * \text{mean temp} + 3.32 * \text{latitude} - 2.15 * \text{longitude}$
50%	Jan-May	$\text{Time} = 82 - 6.15 * \text{mean temp} + 3.07 * \text{latitude} - 2.04 * \text{longitude}$
50%	Jan-Jun	$\text{Time} = 110 - 7.07 * \text{mean temp} + 2.81 * \text{latitude} - 1.93 * \text{longitude}$

N.B. This assumes that longitude east is a positive value and longitude west is a negative value.

Historical information from 2019

The table below summarises the numbers of black bean aphids that were captured in the network of suction traps in 2019.

Aphis fabae	Inverness	Dundee	Edinburgh	Ayr	Newcastle	FERA, York	Preston	Kirton	Broom's Barn	Wellesbourne	Hereford	Rothamsted	Writtle	Ascot	East Malling	Starcross	Total
Week ending																	
31-Mar																	0
07-Apr																	0
14-Apr																	0
21-Apr		1	1										1	1			4
28-Apr		1									1		1	1			4
05-May			1						1			1	10	12			25
12-May									3	2	1	1		9		1	17
19-May			2					1	6	6		4		8		3	30
26-May			3					1	6		4	34		10		1	59
02-Jun	1	2	1	3					2	1		2		4		3	19
09-Jun	1	1		1					2	2			3	2			15
16-Jun			1	1				2	2	6		7	13	35		8	75
23-Jun			1				2	6	18	30	32	78	58	40		15	280
30-Jun		1	1					3	1	44	36	24	14	14		182	320
07-Jul		2				2		15	3	15	51	14	11	12		12	137
14-Jul		2					6	8		34	8	6	2	7		16	89
21-Jul		2		2		2		2		2	1	1	4	1		21	38
28-Jul	2	4		4	1						3	2		1		3	20
04-Aug	4										1						5
11-Aug				1													1
18-Aug				1													1
25-Aug	1		4														5
01-Sep			1	1													2
08-Sep		1	1	3	1		1							1		1	9
15-Sep					1		1	1	1	1			1			1	7
22-Sep	2	4	13		9	4	1	3	2	3				1			42
29-Sep		3	5		3	1	14	3	2		1		2	2		2	38
06-Oct			1				8	15	2				2			2	30
13-Oct								5			1		1		1		8
20-Oct		1				1		4	12	2	1				3	1	25

Background

The black bean aphid (*Aphis fabae*) has a very large range of summer hosts, of which spinach is one. *Aphis fabae* overwinters mainly as eggs on spindle bushes (*Euonymus europaeus*), and a few other shrub species, and occasionally, in warmer locations, as mobile stages on members of the pea/bean family (wild hosts or winter beans). The eggs hatch from late February to early April and colonies develop on young leaves and shoots of the winter host. Winged forms are produced in May/June and these migrate to summer hosts. Reproduction continues throughout the summer, further winged forms are produced in response to crowding and these spread within crops and invade new crops. Populations usually peak in July/August. In autumn *A. fabae* migrates back to spindle and winter eggs are laid. Winged forms of *A. fabae* are captured in the suction traps operated by the Rothamsted Insect Survey. Figure 1 shows the weekly total numbers of *A. fabae* captured in the suction trap at Broom's Barn in Suffolk in 1973.

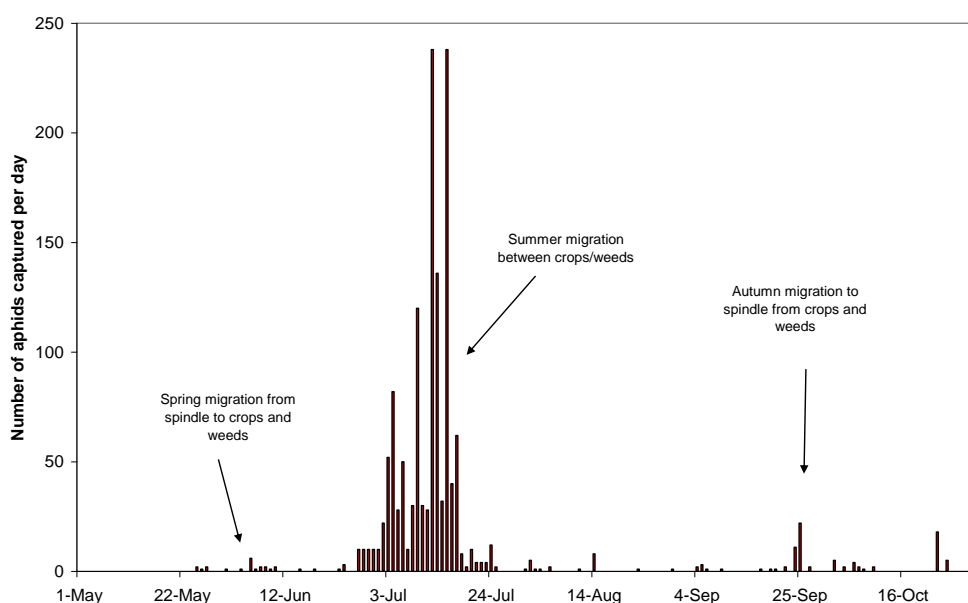


Figure 1 Typical pattern of aphid migration as indicated by suction trap samples (for data from Broom's Barn in 1973). The three phases of migration are indicated.

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Figure 2 shows the total numbers of female *A. fabae* caught at Broom’s Barn from 1966 to 2006, presented as cumulative numbers on each date (from FV 407). A small number of male aphids were captured in the autumn as the winged aphids were returning to spindle to overwinter. These data are not shown. In project FV 407, the date used to separate the summer and autumn flights was 31 August.

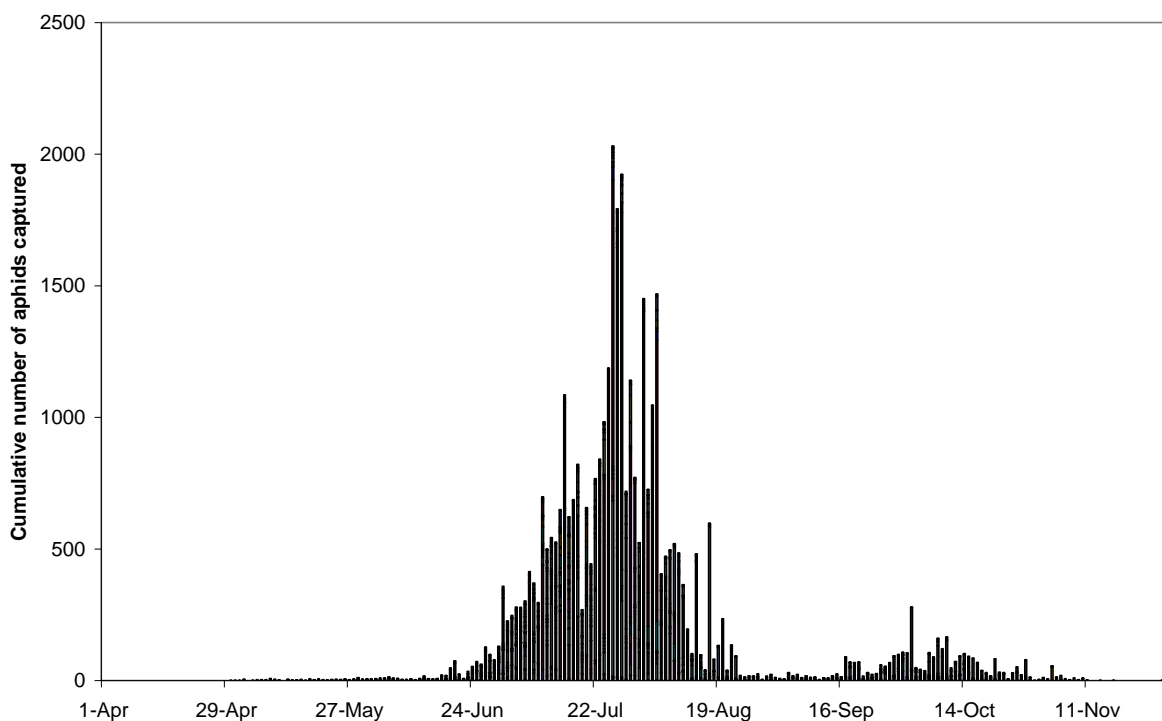


Figure.2

Cumulative numbers of female *A. fabae* caught at Broom’s Barn between 1966 and 2006.