

# Boosting beneficials through the use of flowering strips seminar

*Strategic Farm Week - Winter 2020 Webinar*

Rob Fox, Mark Ramsden, Hannah McGrath and Teresa Meadows

# Housekeeping



**REC** ●



**@AHDB\_Cereals**  
**#strategicfarm**  
**#SFWeekWinter2020**

**Strategic Farm Week – Winter 2020**

**[ahdb.org.uk/sfweek-winter-2020](https://ahdb.org.uk/sfweek-winter-2020)**

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Postcode

# Format



**09:10 – 09:20**

**Rob Fox** *Squab Hall Farm & Strategic Farm West Host*

Introduction to the flowering strips work and reasoning behind the demonstration



**09:20 – 09:50**

**Mark Ramsden** *ADAS Crop Scientist*

Harvest 2020 results and using these on-farm



**09:50 – 10:00**

**Hannah McGrath** *PhD researcher, Rothamsted Research*

Using flowering strips in carrot crops



**Your host...**

**Teresa Meadows**

*Knowledge Exchange  
Manager (East Anglia)*



**10:00 – 10:20**

**Panel discussion with speakers, Brian Barker and questions from the audience**



# Handouts



FARMEXCELLENCE



## Strategic Cereal Farm West Harvest 2020 Report



### Insect Monitoring

Insect monitoring is an important part of IPM. Pest monitoring can be used to determine crop risk and help make management decisions. Monitoring for beneficial insects can be useful to understand the impact of management practices and to assess the level of natural pest control.

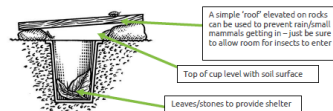
For more information, visit: [ahdb.org.uk/knowledge-library/encyclopaedia-of-pests-and-natural-enemies](http://ahdb.org.uk/knowledge-library/encyclopaedia-of-pests-and-natural-enemies)

### Pitfall traps

#### Method:

1. Choose a suitable site for your trap. Catches will be higher nearer to undisturbed habitats (e.g. field margins). Choose somewhere where it won't be disturbed by walkers or wildlife.
2. Dig a small hole with the trowel and place the empty cup inside.
3. Ensure the top of the cup is level with the soil surface so that invertebrates are more likely to fall in. Backfill the hole around the cup and replace any disturbed surface debris around the edge.
4. If leaving 24hrs place some small rocks in base of the cup to act as shelter for smaller insects (otherwise the beetles might eat each other). It is best to leave overnight as many species are nocturnal. Ensure the rocks cannot be used by the beetles to climb up and escape.
5. If leaving for more than 24hrs, half fill the cup with water and a drop of washing up liquid/detergent. This will break the surface tension so that any insects falling in will drown quickly. This method is likely to catch more insects as fewer will escape.
6. Mark the location of the trap so you can easily find it.
7. When collecting, empty the trap into a Tupperware container to easily see what has been caught.

It is not recommended to leave traps for more than a few days due to the risk of them overflowing or attracting other wildlife.



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### Cereals

	Cultural control	Monitoring	Thresholds
Summer aphids	Provide habitat for natural enemies, particularly parasitic wasps Minimum tillage	AHDB Aphid News Visually examine 100 randomly chosen tillers	50% of tillers infested before GS 61, 66% of tillers infested from GS61 to 2 weeks before the end of grain fill
Autumn aphids	Later sowing date Minimum tillage Grass weed control Tolerant varieties	AHDB Aphid News Visually examine at least 50 randomly chosen plants Sticky/yellow water traps	None – spray if aphids present
Cereal midges	Resistant varieties Rotation Prioritise group 1&2 and seed wheats Encourage natural enemies	Pheromone traps between GS45-61 Part crop and count midges	>120 male midges/trap/day in pheromone traps Feed crops: 1 midge/3 ears, Other crops: 1 midge/6 ears
Wireworm	Rotation (highest risk after grassland) Inversion tillage Rolling	Take 20 10cmx15cm soil cores per 4ha area Alternatively, baited traps available for adults (pheromone) & larvae (plant matter)	Seed treatment at >750,000/ha Damage likely regardless at >1.25 million/ha
Wheat bulb fly	Earlier sowing date Higher seed rate Avoid bare soil July-Aug, delay cultivation	Take 20 10cmx15cm soil cores per 4ha area AHDB wheat bulb fly survey Sticky/yellow water traps	Seed treatment may be necessary when egg numbers >1 million/ha, or if crop was sown Jan-Mar
Frit fly	Early sowing spring oats Rolling spring cereals 4 weeks between ploughing grass & drilling cereals	Check grass/stubble for eggs/larvae before ploughing Crop inspection Sticky/yellow water traps	>10% plants showing damage
Yellow cereal fly	Sow late near woodlands Aim for 200 plants/m <sup>2</sup>	Crop dissection	Economic impact generally low
Leatherjackets	Cultivation July-Aug (where risk is evident)	Take 20 10cmx15cm soil cores per 4ha area Drive 10cm drainpipe into soil and part fill with brine - leatherjackets float to surface	50 leatherjackets/m <sup>2</sup> for spring cereals >50 leatherjackets/m <sup>2</sup> for OSR Or 5 in 12 pipes
Slugs	Cultivation & rolling Increase sowing depth Clear surface residue	Nine refuge traps (13 for fields >20 ha) in a 'W' pattern	Four or more slugs per trap

## Overview of pests & natural enemies



### Cereals

	Ground beetles	Rove beetles	Ladybirds	Soldier beetles	Parasitoid wasps	Web-spinning spiders	Non web-spinning spiders	Hoverfly larvae	Lacewing larvae	Predatory flies	Birds
Summer aphids											
Autumn aphids											
Cereal midges											
Wireworm											
Wheat bulb fly											
Frit fly											
Gout fly											
Yellow cereal fly											
Leatherjackets											
Slugs											

### Oilseed Rape

	Ground beetles	Rove beetles	Ladybirds	Soldier beetles	Parasitoid wasps	Web-spinning spiders	Non web-spinning spiders	Hoverfly larvae	Lacewing larvae	Predatory flies	Birds
Aphids											
Cabbage stem flea beetle											
Pollen beetle											
Cabbage seed weevil											
Rape winter stem weevil											
Brassica pod midge											
Cabbage stem weevil											
Cabbage root fly											
Slugs											

For more information, visit: [ahdb.org.uk/knowledge-library/encyclopaedia-of-pests-and-natural-enemies](http://ahdb.org.uk/knowledge-library/encyclopaedia-of-pests-and-natural-enemies)

# Session objective



Use the Strategic Farm learnings to-date to start to look at pests and beneficials across your farm landscape.

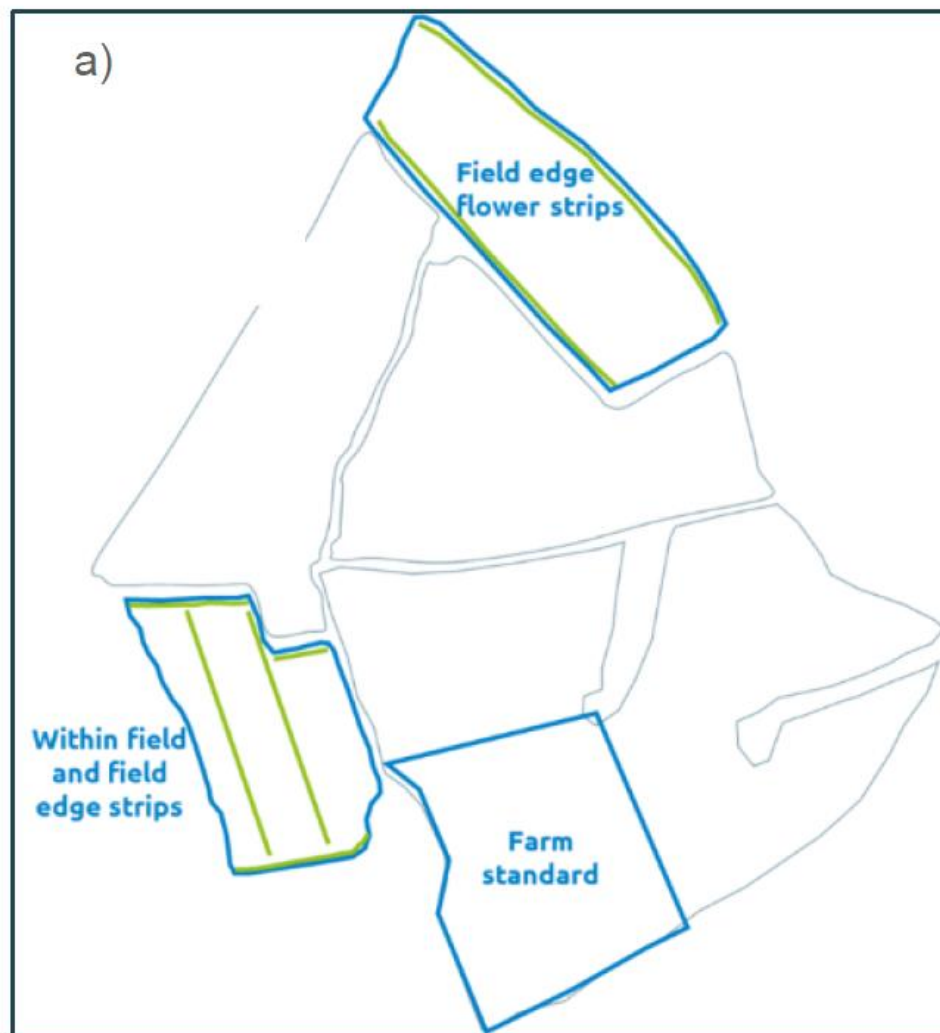
**Q: What would you like to know by the end of this session?**

# Flowering strips – introduction and reasoning

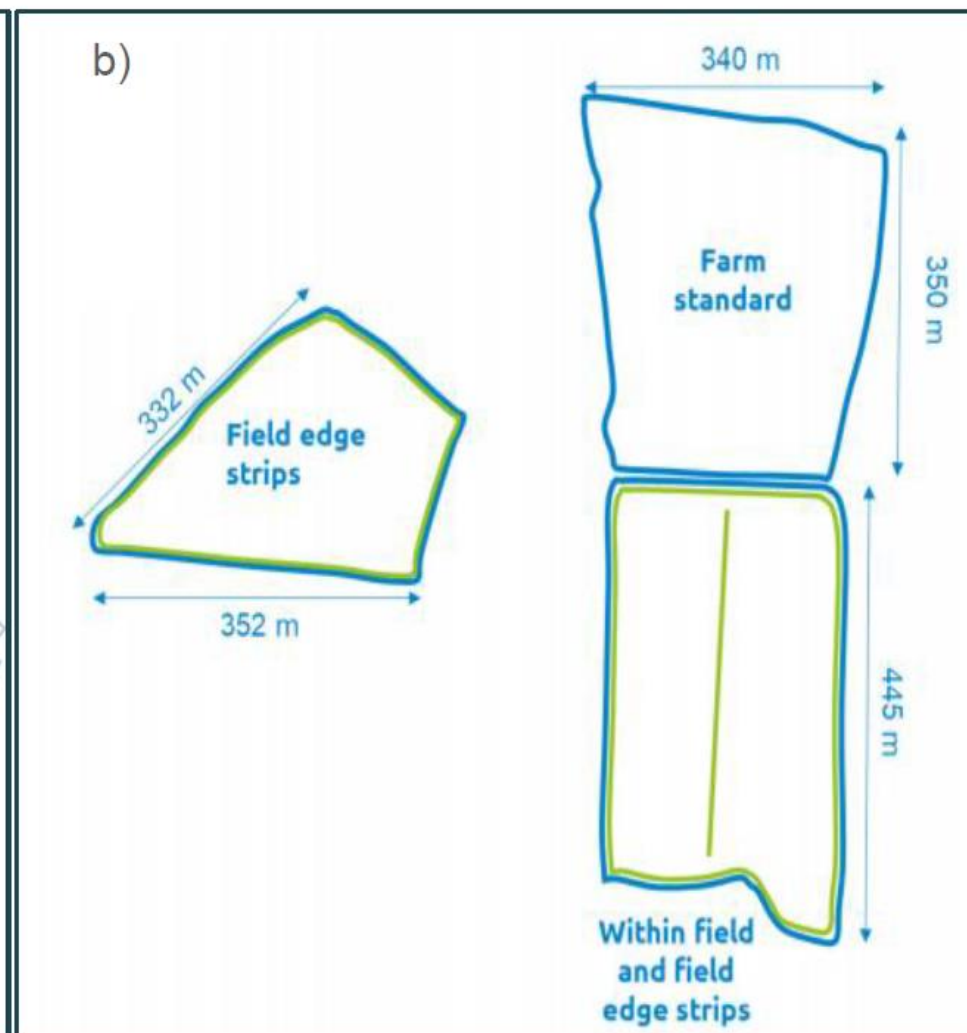
Rob Fox, Squab Hall Farm and Strategic Farm West Host

# Flowering strips trial

## West



## East





# Flowering strips trial - West





# Pests, natural enemies and flower strips

AHDB Strategic Farms 2019-20

Dr Mark Ramsden

19 November 2020

[www.adas.uk](http://www.adas.uk)





# Objectives

Objective 1 - Investigate the variation of slugs, cereal aphids and their respective natural enemies.

Objective 2 – Assess the establishment of the flowering strips

Objective 3 – Assess the impact of in-field flowering strips on yield





# Assessments



Slug trap using chicken layers' mash as bait



Visual assessment of aphids on cereals



Pitfall trap used to collect ground dwelling invertebrates



Assessment of plant species numbers



Yield assessment using combine yield maps





# Slugs

## Key message

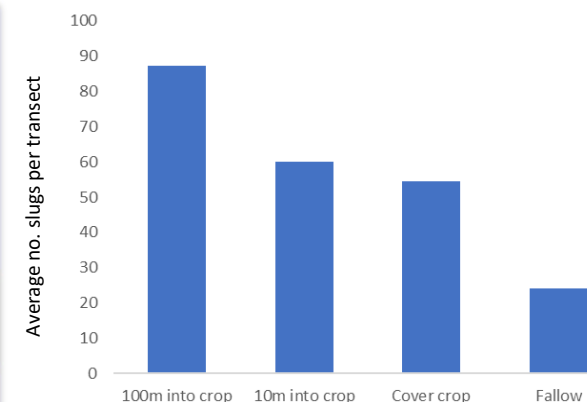
- Slug abundance was relatively low at SFW.
- Variation was high within and between farms.
- Slug assessments should always be carried out per field, ideally treating only areas of high activity.



Grey field slug *Deroceras reticulatum*  
Most common species recorded.

Field	Field 6	Field 7	Field 40	Field 42	Field 43	Field 10A	Field 14A	Field 6A	Big Guinea Row	Bottom 59	Kells	Tom Dixon	Top 59	Wlals	Apple Tree	Blacksmiths	Meadow
Autumn results	5	5	3	1	7	5	41	31	27	14	0	1	11	2	2	14	x
Summer results	0	0	x	x	0	0	0	0	0	0	x	x	0	0	0	0	0

Units = average number of slugs per trap; threshold for treatment = 4 slugs per trap



Average number of slugs per transect at 100m into establishing crops, 10m into establishing crops, in cover crops or in fallow land, in October 2019.



# Ground dwelling beneficials

Group 1



8-18mm  
General predators  
Open habitat

Group 2



15-25mm  
General predators  
Mixed habitat

Group 3



4-9mm  
Seed eaters  
Dense habitat

Group 4



3-5mm  
Springtail predators  
Mixed habitat

Group 5



5-9mm  
General predators  
Dense habitat

Group 6



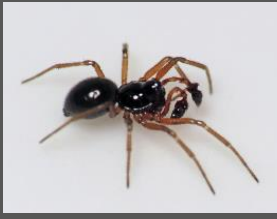
3-10mm  
General predators  
Mixed habitat

Group 7



5-10mm  
Omnivores  
Dense habitat

Money spiders



>5mm  
General predators  
Structured habitat

Ground spiders



6-8mm  
General predators  
Dense habitat



# Overall findings

		Total	Field 6	Field 7	Field 40	Field 42	Field 43	Field 10A	Field 14A	Field 6A	Big Guinea Row	Bottom 59	Kells	Tom Dixon	Top 59	Wlaly's	Apple Tree	Blacksmiths	Meadow	Shrub	Paddocks
Slugs	Autumn results	169	5	5	3	1	7	5	41	31	27	14	0	1	11	2	2	14	x	x	x
	Summer results	0	0	0	x	x	0	0	0	0	0	0	x	x	0	0	0	0	0	x	x
Group 1 Generalist predatory ground beetles, eating anything they can catch.	Autumn results	182	12	12	6	18	43	18	3	13	1	4	2	5	14	2	18	11	x	x	x
	Summer results	1026	308	103	x	x	161	114	123	121	3	1	x	x	5	48	14	18	7	x	x
Group 2 Large predatory ground beetles, eating slugs, worms, and other invertebrates	Autumn results	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	x	x	x
	Summer results	34	2	1	x	x	2	0	0	0	8	0	x	x	0	12	1	8	0	x	x
Group 3 Seed eating ground beetles	Autumn results	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	x	x	x
	Summer results	20	2	0	x	x	0	0	0	0	0	0	x	x	1	1	0	1	15	x	x
Group 4 Small predators, mainly eating collembola (springtails) and other small invertebrates	Autumn results	20	1	0	0	0	0	0	0	0	2	0	0	1	3	1	3	9	x	x	x
	Summer results	3	0	0	x	x	0	0	0	0	0	1	x	x	0	0	0	2	0	x	x



# Aphid assessments

		Total	Field 6	Field 7	Field 40	Field 42	Field 43	Field 10A	Field 14A	Field 6A	Big Guinea Row	Bottom 59	Kells	Tom Dixon	Top 59	Wlaby	Apple Tree	Blacksmiths	Meadow	Shrub	Paddy
Cereal aphids	GS60 results	1707	177	223	424	29	12	x	x	x	x	x	194	141	x	109	6	7	x	219	166
Cereal aphid mummies	GS60 results	154	28	20	13	13	9	x	x	x	x	x	10	15	x	9	2	4	x	19	12
Cereal aphid predators	GS60 results	71	2	18	2	17	2	x	x	x	x	x	3	3	x	4	0	0	x	12	8

Numbers of aphids per 200 tillers – treatment threshold would be 1,000 per 200 tillers



# Actions

Action	Description	When
Pitfall trapping	Install two pitfall traps, one in the field margin and one in the adjacent crop. Count what you see in each and consider what might be influencing the differences.	Sep – Nov Apr – Jul
Slug bait traps	Monitor slug abundance over time, and compare changes in different locations. Consider what might be driving any differences you see.	Sep – Nov
Review your landscape	Identify all the areas on and around your farm where floral resources are available. Observe the different insects in and around these habitats and compare what you see with areas far away from floral resources.	May - Jul
Create habitat for beneficial species	In most agricultural landscapes there is often a lack of suitable floral resource for beneficial insects. Aim for a spread of resources across the farm, rather than all at one site, and select plants known to be beneficial – flowers that are good for bees might not be good for natural enemies. Don't expect immediate results – it can take a few years for populations to build up.	Drill in spring or early autumn for flowering the following year.





# Plans for 2021

- Monitoring changes in species around flowering strips to demonstrate impact
- Repeat monitoring of ground beetles to see any changes in species or abundance in and around the flowering strip
- Monitor other pests, beneficials and pollinators.





# Bespoke flowering strips for pest control in carrots

---

Hannah McGrath (*Rothamsted and Reading*)

Supervised by: Rosemary Collier (*Warwick*), Ben Madarasi (*Huntapac*), Simon Potts (*Reading*), Stephen Shields (*Huntapac*), Sam Cook & Jonathan Storkey (*Rothamsted*).

 @hmcgrath93



# The plan...

Part I

## The theory



Part II

## Sampling



Part III

## Harvest





Part I

---

# The theory



ROTHAMSTED  
RESEARCH



@hmcgrath93

© Hannah McGrath

# Why carrots?

## In carrots:

- Aphids transmit viruses to carrots
- 15% yield losses in an expensive crop

## In general:

- improvements for growers' pest management approaches
- providing *relevant* evidence on how to reduce reliance on insecticides





# Why would flowering strips even have an effect on pests?

Flowering strip are based on the principle of **conservation biological control**:

- **S**helter
- **N**ectar
- **A**lternative food
- **P**ollen







Not all flowers  
are equal

# My PhD question

---

What's the best mix  
of annual flowers  
put into carrot fields  
to support both  
pest control and  
pollination?



Part II

# Sampling









VEGETATION



VIRUS



APHID  
COUNTS



INSECT  
COMMUNITY



SENTINEL  
CARDS



HARVEST



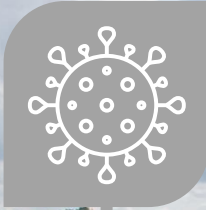
How good are the treatments?  
Establishment, weed abundance &  
flowering phenology of strips  
*Through visual assessments*



VEGETATION



VIRUS



APHID  
COUNTS



INSECT  
COMMUNITY



SENTINEL  
CARDS



HARVEST



Are there different levels and types of virus  
between treatments?

Collaboration with PhD student at FERA &  
University of Newcastle.

*Plant foliage sampled to be sequenced for virus.*



VEGETATION



VIRUS



APHID  
COUNTS



INSECT  
COMMUNITY



SENTINEL  
CARDS



HARVEST



Are there different numbers of aphids and natural enemies on carrot foliage between treatments?

*Destructively sample 0.2m<sup>2</sup> area of carrot foliage and freeze before removing any insects present*



VEGETATION



VIRUS



APHID  
COUNTS



INSECT  
COMMUNITY



SENTINEL  
CARDS



HARVEST



Are there different insect communities in the  
treatments? What about natural enemies?  
What about pollinators?

Water traps and Flower-Insect Timed counts



VEGETATION



VIRUS



APHID  
COUNTS



INSECT  
COMMUNITY



SENTINEL  
CARDS



HARVEST



How many aphids are removed from a card over a 24-hour period between treatments?

*Place a card inoculated with 5 aphids next to the flowering strips. 24 hours later, count the remaining aphids.*



VEGETATION



What  
the tre

Virus-y  
carrot



Normal  
carrot



EL  
S

HARVEST



ent to  
s and



# What were the results?

We can successfully increase populations of useful insects:

INSECT  
COMMUNITY



But it's not just about counting ladybirds, we need to quantify their effect on the crop.

From this field, there are no significant differences in the:

APHID  
COUNTS



SENTINEL  
CARDS



HARVEST



The flowering strips, in this case, haven't improved crop relevant metrics of pest control compared to control carrots not sprayed with insecticides.

Part III

# Harvest







# How we can look at economic factors?

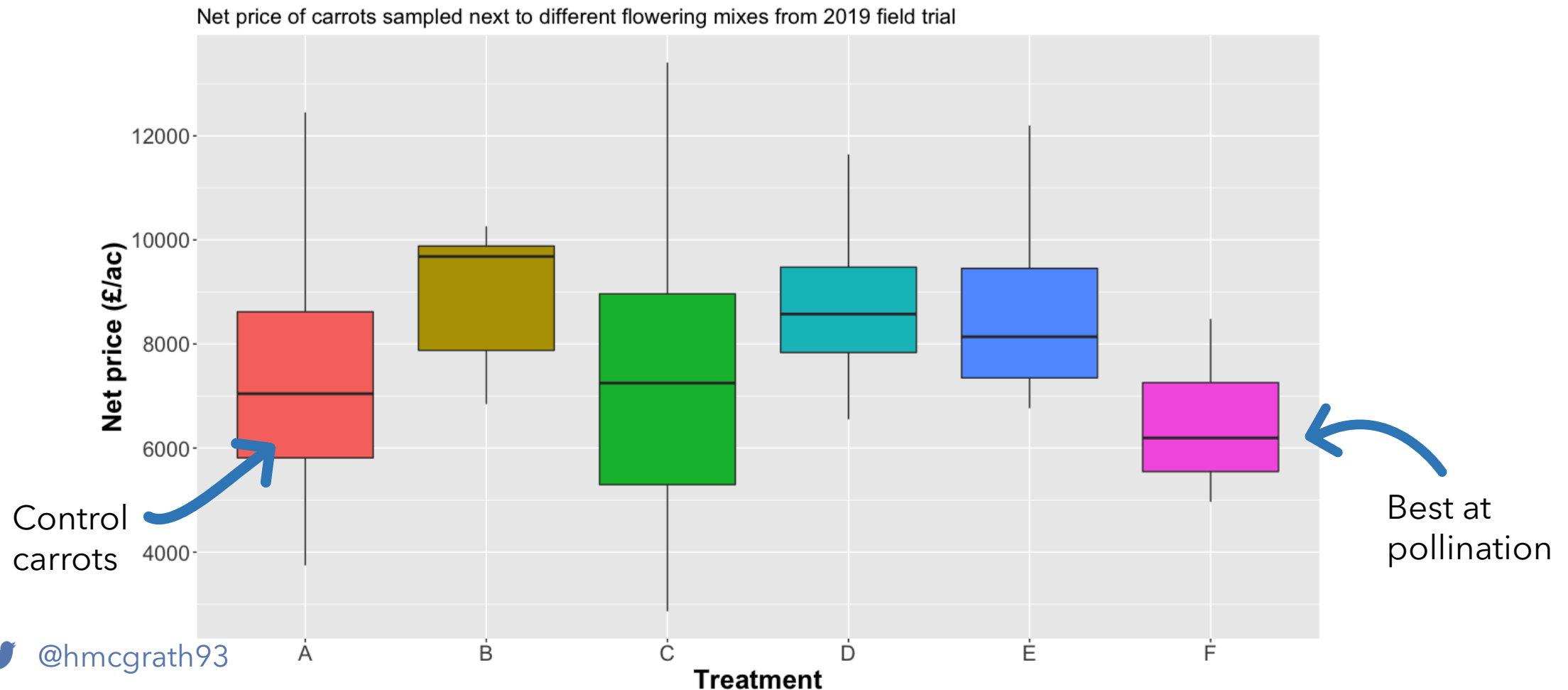
Treatment	Mean % Virus rejections	Mean % Cavity spot rejections	Mean % pack out	Mean gross yield t/ac	Mean net yield t/ac	Mean net price £/ac
Carrots	1.7	23.7	51.9	35.9	18.8	7505
B	1.5	6.2 <sup>\$</sup>	65.1 <sup>†</sup>	34.1	22.3	8901 <sup>†</sup>
C	2.6	21.3	52.1	35.1	18.4	7361
D	1.7	6.5 <sup>\$</sup>	65.7 <sup>†</sup>	33.2	21.8	8733
E	1.6	14.5	57.0	37.9	21.6	8652
F	2.0	26.9	43.9	37.6	15.9	6399 <sup>\$</sup>



# There is variability though...



HARVEST  
DATA





"Evidence matters,  
but perception is important"

Rob Yorke (@blackgull)

# Take home messages

- We can get flowers in the field!
- What can you do on your own farm? Experiment yourself...
- Whole farm approach – how do these fit in?







ROTHAMSTED  
RESEARCH



University of  
Reading

Waitrose  
COLLABORATIVE TRAINING  
PARTNERSHIP

HUNTAPAC

Thanks to those involved!

Supervised by: Rosemary  
Collier, Sam Cook, Ben  
Madarasi, Simon Potts,  
Stephen Shields &  
Jonathan Storkey

Hannah.mcgrath  
@rothamsted.ac.uk | @hmcgrath93

And my thanks to all the  
Huntapac farm team for their  
advice and willingness to  
undertake this work



# Questions and Discussion





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# Further information



# Resources



[ahdb.org.uk/sfweek-winter-2020/results](https://ahdb.org.uk/sfweek-winter-2020/results)

# Resources

- AHDB Encyclopaedia of pests and natural enemies
- AHDB Integrated slug control factsheet
- <https://ahdb.org.uk/pests>
- ASSIST Research
- GWCT Wildflower mixes and pollen and nectar strips



## Cereals

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## Overview of pests & natural enemies

### Cereals

	Ground beetles	Rowe beetles	Ladybirds	Solidier beetles	Parasitoid wasps	Web-spinning spiders	Non-web-spinning spiders	Hoverfly larvae	Lacewing larvae	Predatory flies	Birds
Summer aphids											
Autumn aphids											
Cereal midges											
Wireworm											
Wheat bulb fly											

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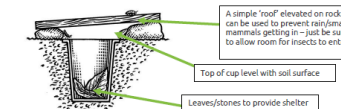
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# Strategic Farm Week – Winter 2020



**Watch** Strategic Farm research videos



**Take part** in the webinars



**Listen** to the podcast special



**Download** the harvest report and 'how to' resources

**All at:** [ahdb.org.uk/sfweek-winter-2020](https://ahdb.org.uk/sfweek-winter-2020)

# Coming up...

## **Strategic Farm Week:**

- ✓ 9am, Fri – Ask the researcher

## **Wider AHDB:**

- Monitor Farm Mondays
- Agronomy week
- Regional and technical events

**Info and register at: [ahdb.org.uk/events](https://ahdb.org.uk/events)**



# Could you be a Strategic Cereal Farm host 2021-2027?

- Are you an ambitious arable farm/enterprise in the following counties?
  - Yorkshire
  - Lancashire
  - Dorset
  - Gloucestershire
  - Wiltshire
  - Hampshire
  - Oxfordshire
- Do you want to test and show case research, share technical and financial performance and have ambitions to advance your business and personal development?

**Applications open Monday 23 November 2020**  
[ahdb.org.uk/farm-excellence/recruitment](https://ahdb.org.uk/farm-excellence/recruitment)  
Any questions? Email: [Natalie.Gilbert@ahdb.org.uk](mailto:Natalie.Gilbert@ahdb.org.uk)



# Thank you



**REC** ●



@SquabRob  
@mwrmsden  
@HMcGrath93  
@The\_Barker\_Boys  
@CerealsEA  
@AHDB\_Cereals

**Teresa Meadows**  
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**07387 015465**

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